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Cook's

American

Arithmetic

1800

5
60
2

COOK's
AMERICAN ARITHMETIC;

BEING A

Syſtem of Decimal Arithmetic;

COMPORTING WITH THE FEDERAL CURRENCY OF
THE UNITED STATES OF AMERICA.

TO WHICH IS ANNEXED,

BY WAY OF SECOND PART,

THE

AMERICAN SURVEYOR.

THE WHOLE ON AN ENTIRE NEW PLAN.

TO WHICH IS ADDED,

A DRAUGHT OF INSTRUMENTS, ADAPTED TO
CARRY THE ABOVE INTO EFFECT.

THE WORK IS RENDERED EASY, AND MAY BE
OF GREAT USE TO THE CITIZENS OF
THE UNITED STATES.

By DAVID COOK, JUN.

NEW HAVEN: PRINTED BY THOMAS GREEN AND SON.
M,DCCC.

[*Entered according to Act of Congreſs.*]

X 22
A
3 ed.

10-2-41

To the Citizens of the UNITED STATES of AMERICA.

My Friends and Fellow Citizens,

IN the following work I have endeavoured to ſimplify the Syſtem of Arithmetic, by caſting away the former proportion of fractions, with their denominations; giving all fractions bearing the ſame relation to their reſpective Integers, one denomination, according to the diſtance they are placed, from the place of their reſpective Integers, and have called them, tenths, hundreths, thouſenths, &c. &c. except it be in the Federal Currency of theſe United States, which is Eagles, Dollars, dimes, cents and mills; which, notwithſtanding, bear the ſame relation to each other as fractions in every other deſcription of either weights or meaſures. One Dollar being one tenth of an Eagle, one Dime, one hundreth, one Cent, one thouſenth, and one Mill, one ten thouſenth part of an Eagle; or otherwiſe, one Dime, one tenth of a Dollar, one Cent, one hundreth, one Mill, one thouſenth part of a Dollar.

By this method of ſimplifying fractions, the mind both of the learner and practioner are freed from the heavy embarraſſment of copying therein, ſuch numbers of irregular Tables, as they by every other method, are both obliged to learn and retain; by reaſon of which, multitudes of our fellow citizens, as well as the inhabitants of other countries, have been diſcouraged in the purſuit of Arithmetic, and thereby rendered incapable of performing thoſe ſervices either to their families or reſpective countries, as they might have done, had they been maſters of this ſcience.

As to the accuracy, and utility of the work in diſpatch of buſineſs, it will be eaſily diſcovered, when compared with former methods of operations, if the maſk of prejudice be fairly caſt off.

The ſecond Part of this work is likewiſe a ſimplification of the Art of Surveying, by a new ſet of Inſtruments; which I have formed to operate in conformity with the Syſtem of Arithmetic, which are ſimple, and anſwer without difficulty the Acre, or Square Miles, contained in Surveys of any deſcription, according to the Chain uſed. It is generally performed by Multiplication without any aſſiſtance of Long-Diviſion, and rarely any by ſhort, except in halving differences of lines, leaving the fraction, bearing the ſame relation to its Integer, whether it be a Square-Mile, Acre or Chain, as in the Federal Currency.

Thus I have endeavoured to caſt off the veil of myſtery in theſe Arts, and render them of utility, in their native ſimplicity.

In this form I preſent to your conſideration the work at large, hoping you will pardon the preſumption of my pen, and the inaccurate arrangement of the work.

I have the happineſs to be,

Your Fellow-Citizen,

THE AUTHOR.

To the Gentlemen Subſcribers for the following Work.

MY FELLOW CITIZENS,

AFTER having for many years contemplated an alteration of the Syſtem of Arithmetic (ſo called) the old having appeared ſo dark and intricate, that very few were able to acquire a competent knowledge of it, the various tables and technical terms appeared to be too numerous for retention.

Altho' it is called a ſyſtem, yet it appears to be compoſed of as many ſyſtems as there are rules, as no two rules agree in relation to the fractional part of their ſeveral integers, and every rule is deſtitute of a ſyſtematical uniformity of its ſeveral fractional relations, which involves it in myſtery; from the foregoing conſiderations one would naturally judge it could not be compoſed by one perſon, but by many and in different parts of the world, collected together, put into the hands of a printer, printed and called a ſyſtem.

If it was a real ſyſtem, every fraction would bear a uniform relation to its reſpective integer, in ſuch manner that neither the learner or practitioner would be liable to fall into error.

On the laſt principle I have endeavoured to predicate this ſmall, but I truſt, uſeful treatiſe, which idea I aimed to communicate in my propoſals for printing.

It gives me great happineſs to find you have received my propoſals with the generous and inquiring principles of free and independent citizens of America, by liberally ſubſcribing for the impreſſion. In a ſhort time I received ſubſcriptions for about ſeven hundred copies.

I muſt with gratitude conſider you as the firſt patrons of this work, and truſt that poſterity will have reaſon to bleſs the memory of thoſe who have ſo liberally ſubſcribed to a work of this nature, which renders the ſcience of numbers plain and eaſy.

I truſt you will conſider this work in its infant ſtate, as I have had no aſſiſtance from any author by way of copying or from any mathematician, it being my own invention. I have the happineſs to be your fellow citizen, THE AUTHOR.

The words *hundreth, thouſenth, millienth, bredth, neet,* &c. are by direction of the *Author*, and not to be imputed to the Printer.

RECOMMENDATIONS.

ON a view of Mr. Cook's Syſtem of Decimal Arithmetic, we are of opinion it is calculated to anſwer valuable purpoſes, as it coincides *with* and is intended to extend the federal method of reckoning:—recommend it as deſerving encouragement and ſupport.

ISAAC BEERS.
BELA HUBBARD.
ELIAS BEERS.
HENRY DAGGETT.
HEZ'H HOWE.
JOSEPH DARLING.
THAD's BEECHER.

New-Haven, March 18, 1800.

HAVING, at the requeſt of Mr. David Cook, jun. peruſed his Syſtem of Decimal Arithmetic, we eſteem it a work of much ingenuity, and apprehend there is nothing of the kind extant, from which ſo great utility may ariſe; and which ſo highly deſerves the patronage of the public. We cheerfully recommend it to ſchools and to the community at large.

ASA KING.
I. & K. TOWNSEND.
WILLIAM TOWNSEND.
AMOS DOOLITTLE.
ELI HOTCHKISS.
JEREM'H ATWATER, 3d.

New-Haven, March 19, 1800.

I HAVE peruſed the following work, and think it calculated to be very uſeful.

PIERPONT EDWARDS.

New-Haven, March 19, 1800.

SIR,

I HAVE inſpected, as carefully as my official buſineſs would permit, a copy of your American Arithmetic. The plan, and execution of it are, in my opinion, juſtly entitled to the approbation and encouragement of your countrymen. It renders the ſcience more ſimple and, conſequently, more eaſily learned, and practiſed. It is calculated to propagate the *federal* mode of computing, and to remove the numerous inconveniencies which ariſe from the *diverſity* of methods that exiſt in the ſeveral States of our Empire.

I, therefore, ſincerely *wiſh*, but being a ſtranger cannot *hope*, to contribute much to the currency of your Book. I am, with due reſpect, yours, &c.

JOHN GEMMIL.

Mr. David Cook, jun.

New-Haven, March 17, 1800.

SIR,

I HAVE peruſed your new Syſtem of Arithmetic; think it a work of ingenuity; and am of opinion, that could it receive the ſanction, of the public authority, would be of general utility, to the people of the United States. I am, with eſteem, Sir, your moſt obedient ſervant,

EBEN'R PARMELE.

Mr. Cook.

To the Gentlemen Inſpectors of the following Work.

CITIZENS,

I FEEL myſelf ſtimulated with principles of gratitude to you, for your generous attention in the examination of the following work, and for the high opinion you exhibit of its utility in your letters of recommendation. I conſider myſelf under great obligations to you as patrons of this work, and expect the riſing generations will have reaſon to recollect your names with gratitude to your memory, as patrons of a work that has been productive of removing the myſtery theſe uſeful arts have been involved in for many ages; which, by your patronage has been removed, and theſe ſciences rendered plain and ſimple.

On my part whilſt I am of ability I ſhall accept your remarks on the work (wherein you ſhall judge it deficient) as favors, and ſhall endeavour to correct and enlarge as ſhall appear neceſſary. I have the happineſs to be your fellow citizen, THE AUTHOR.

The Yardſtick is divided into tenths, and hundreths. One tenth of a yard bears the ſame relation to a yard, as a dime does to a dollar, and one hundreth, that of a cent.

The Two Feet Rule is of the ſame length as that now in common uſe, but each foot is divided in the ſame manner as the yardſtick, into tenths and hundreths.

The Steelyards.

The ſmall ſide is divided into pounds, and the pounds into tenths. The under line of numbers are placed at their decimate diſtance from the place of an hundred weight.

The large ſide of the bar is divided into pounds on the upper ſide, and the pounds divided into three diviſions, and may be called ,25 hundreths, 5 tenths and ,75 hundreths, or one quarter one half and three quarters of a pound.

The under line of numbers are placed at their decimate diſtance from the place of an hundred weight. See the plate.

Theſe ſteelyards will ſhew the exact weight of an article, whither groſs or neet in the ſame notch, by the aſſiſtance of two poize weights, the neet poize balances 25lb. groſs in the 28lb. notch, and the groſs poize balances the ſame weight in the 25lb. By this method of adapting the poize to each other, you may obtain an accurate anſwer from the ſame bar, from one tenth of a pound to any number of pounds according to the bigneſs of the bar.

The groſs poize marked G.

Neet poize marked N.

See the plate.

The utility of the above inſtruments will clearly appear by their operation in the following work.

ADDITION OF MONEY.

I BEGIN in the firſt place, as introductory to this Rule, to lay down ſome ſhort, but, neceſſary Tables.

Firſt, A Table ſhewing the parts of a dollar.

TABLE FIRST.

,001. Mill or One Thouſanth of a Dollar.
,01. Cent or One Hundredth of a Dollar.
,1. Dime or One Tenth of a Dollar.
1, Dollar or One Tenth of an Eagle.
10, Eagle or Ten Dollars.

OR THUS,

10, One Eagle is 10,000. Thouſ. Mills, 10,00 Cts. 10,0 Dimes, or 10, Dollars.

You muſt always mind to place Eagles under Eagles —Dollars under Dollars—Dimes under Dimes—Cts. under Cents, and Mills under Mills. You muſt be always careful to place a comma, which I ſhall call a Decimal Point, between your Dollars and Dimes, or always at the right of Dollars, or the place of Dollars, or at the left of Dimes or place of Dimes.

NUMERATION TABLE.

Hund. Thouſ. of Millions.	Ten Thouſ. Millions.	Thouſand of Millions.	Hunds. of Millions.	Tens of Millions.	Millions.	Hunds. of Thouſands.	Tens of Thouſands.	Thouſands.	Hunds.	Tens.	Units.	Tenths.	Hundredths.	Thouſandths.	Ten Thouſanths.	Hund Thouſanths.	Millienths.	Ten Millienths.	Hund. Millienths.	Thouſ. of Millienths.	Ten Thouſ. of Millienths.	Hund. Thouſ. of Millienths.
1	2	3,	4	5	6,	7	8	9,	0	1	2,	1	2	3	4	5	6	7	8	9	0	1
	1	2	3	4	5	6	7	8	9	0	1,	2	3	4	5	6	7	8	9	0	1	
		1	2	3	4	5	6	7	8	9	0,	3	4	5	6	7	8	9	0	1		
			1	2	3	4	5	6	7	8	9,	4	5	6	7	8	9	0	1			
				1	2	3	4	5	6	7	8,	5	6	7	8	9	0	1				
					1	2	3	4	5	6	7,	6	7	8	9	0	1					
						1	2	3	4	5	6,	7	8	9	0	1						
							1	2	3	4	5,	8	9	0	1							
								1	2	3	4,	9	0	1								
									1	2	3,	0	1									
										1	2,	1										
											1,											

The characters or numbers, by which Arithmetic is performed, are nine and a cypher.

1. 2. 3. 4. 5. 6. 7. 8. 9. 0.

10 Mills make One Cent.
10 Cents make One Dime.
,10 Dimes make One Dollar.
,10 Dollars make One Eagle.
,125 Mills is one eighth of a Dollar.
,25 Cents is one fourth of a Dollar.
,5 Dimes, or 50 Cents, is half a Dollar.

,75 Cents is three fourths of a Dollar.
1,00 Cents is One Dollar.

Characters to be obſerved.

D. Dollars.
d. Dimes.
c. Cents.
m. Mills.

, Decimal Point, this ſhould always be placed between whole and decimal parts.
,1 Tenth.
,01 Hundreth.
,001 Thouſenth.
,0001 Ten Thouſenth.
,00001 Hundred Thouſenth.
,000001 Millienth.
,0000001 Ten Millienth.
,00000001 Hundred Millienth.
,000000001 Thouſand Millienth.
,0000000001 Ten Thouſand Millienth.
,00000000001 Hundred Thouſand Millienth.

You may read the following numbers, thus,

1, One Dollar.
1,0 Ten Dimes.
1,00 One Hundred Cents.
1,000 One Thouſand Mills.

In this Rule you will always obſerve : Firſt, *To ſet down your Numbers in the followirg manner,* thus :

D.	d.	c.	m.
4,	5	3	2
3,	1	0	4
1,	6	7	1
9,	2	4	6
8,	4	5	3
6,	9	4	7
5,	8	9	9
2,	5	8	8
42,	4	4	0

You muſt begin at the right hand column of Figures, And ſay, 8 & 9 is 17, and 7 is 24, and 3 is 27 & 6 is 33 and 1 is 34 & 4 is 38 & 2 is 40, which is 4 cents, place down 0. and carry 4 to cents in the next column. In the ſame manner you muſt proceed, through the ſum, ſetting what is remaining over ten, or tens under its reſpective column, and the ten or tens you find in the left hand column you muſt ſtill ſet to the left. Thus you find the Anſwer in the firſt ſum to be 42 dollars and 44 cents, ſtanding thus,

D. d. c. m.
42, 4 4 0

To prove any ſum in Addition, begin at the top of the right hand column, and add them downwards, and ſet down your footing of the ſum under the firſt footing, and if they agree, your ſum is proved.

I think it uſeleſs to enlarge any more, as every ſum in this rule is anſwered in the ſame manner as above.

I ſhall now proceed to ſet down a number of ſums, for the exerciſe of the learner.

D. d. c. m.	D. d. c. m.	D. d. c.m.	D. d.
11, 2 4 3	642, 3 7 8	924, 7	4672, 9
42, 0 7 2	973, 0 9	47, 8 2	9780, 4
39, 9 4 9	865, 9 4	682, 6 5	6302, 6
24, 0 9 8	736, 0 7 6	90, 7 5	9070, 7
73, 4 2 7	554, 6 5 4	64, 3 4	5792, 3
67, 3 3 2	231, 5	170, 5	3120, 2
98, 8 4 7	417, 7 5	734, 2 5 5	1402, 1
36, 6 2 4	824, 2 5	538, 3 4 7	7494, 8

D. d. c. m.	D.	D. d. c. m.	D. d. c. m.
34, 9 9 9	320,	4, 3 1 5	0, 4 5
64, 6 4	400,	0, 0 0 3	, 0 7
7, 9	23,	6, 9	, 4 5
38, 7	40,	4, 2 5	, 9 9 9
2, 6 4 3	170,	0, 0 9 2	, 0 6
13,	232,	0, 7 5	, 7 5
14, 7	54,	29, 5	, 5
27, 6 2	9,	2, 0 6	, 6 4 2
11, 0 7	18,	6, 4 5	, 0 9
15, 4	80,	0, 5	, 2 5
16, 0 0 5	197,	1, 9 3	, 8
9, 0 2	325,	14, 4 6 5	, 7

AVOIRDUPOISE WEIGHT OR NEET.

By this weight is ſold, beef, butter, cheeſe, pork, lard, wool, flax, &c.

I have conſidered this Rule, decimally, and have reduced it accordingly to that ſtandard, allowing the pound to be the ſame as is now in common uſe.

You muſt obſerve the following Characters.

lb. Pounds.
t. Tenths.
h. Hundreths.
th. Thouſenths.

For further information relative to the valuation of fractions, ſee numeration table annexed to the firſt Rule in this work.

Explanatory Table.

lb. t.		t. h.	
,1		,0 1	
,2		,0 2	
,3		,0 3	
,4	Tenths	,0 4	H
,5	of a	,0 5	
,6	Pound.	,0 6	
,7		,0 7	
,8		,0 8	
,9		,0 9	
1,	One Pound.	,1	Tenth.

th.		t. h.th.	
,001		,1 2 5	th. o
,002		,2 5	h. or
,003		,3 7 5	th. or
,004	Thouſenths	,5	t. or
,005	of a	,6 2 5	th. or
,006	Pound.	,7 5	h. or
,007		,8 7 5	th. or
,008		1,	Pou
,009			
,01	Hundreth.		

You muſt be careful to place your decim
in the table is ſhewn.

I think the foregoing explanations to be ſ
direct the learner in this rule.

I now paſs on to ſet down the followin
improvement.

lb.	lb.	t.	h.	lb.	t.	h.	th.	lb.	t.	h.
4,	34,	7	5	346,	3	7	9	1460,	7	3
6,	70,	9		790,	4	6		7923,	9	7
8,	94,	8	3	800,	2	7	5	9284,	8	
9,	47,	2	5	471,	9	8	7	761,	4	
2,	68,	5		632,	3	4	6	826,	6	5
7,	84,	1	2	564,	1	2	3	571,	8	5
3,	92,	0	6	946,	4	3	5	123,	9	9
5,	51,	9		207,	6	9		6265,	5	
7,	60,	0	9	98,	4	7	2	931,	2	5

lb.	t.	h.	lb.	t.	lb.	t.	lb.	t.	h.	th.
574,	4	6	1,	1	,	1	,	1	1	1
94,	5		2,	2	,	2	,	2	2	2
172,	7	5	3,	3	,	3	,	3	3	3
607,	8	3	4,	4	,	4	,	4	4	4
920,	9	4	5,	5	,	5	,	5	5	5
567,	2	5	6,	6	,	6	,	6	6	6
48,	6	2	7,	7	,	7	,	7	7	7
407,	9	9	8,	8	,	8	,	8	8	8
231,	7	4	9,	9	,	9	,	9	9	9
572,	4		10,		1,		1,			
363,	7		11,		2,		2,			

The Neet Hundred,

Is known by pointing off the two right-hand figures, and what ſtands to the right is tenths, or hundreth parts, and to the left, hundred or hundreds.

I here place down a few Sums for working.

C. lb.	C. t. h.		C. lb. t. h. th.
46, 78,	43, 1 2	or	64, 62, 3 4 5
36, 79,	37, 2 5		21, 76, 7 5
12, 34,	18, 3 4		34, 25, 5
9, 41,	45, 4 5		52, 96, 2 5
7, 04,	26, 5		75, 50, 9 9 9
54, 63,	39, 6 4		94, 75, 6 0 4
76, 35,	26, 7 5		47, 99, 0 7 5

You are to pay no more regard to the point in adding than if they were entire whole numbers, as to adding.

Great Hundred or Groſs Weight.

By this weight is weighed, Sugar, Allum, Copperas, Red & Logwoods, Hay, &c.

Explanation Tables.

,25 is One Quarter of an Hundred.
,5 is Half an Hundred.
,75 is Three Quarters of an Hundred.
,125 is One Eighth of an Hundred.
,0625 is One Sixteenth of an Hundred.

Thus you will find the foregoing Table in proportion to One Hundred neet weight, each pound of the
h.th.t.
Great hundred, being equal to ,0112 of neet-weight,
lb. t. h.
or in other terms equal to 1, 1 2 that is 1lb. and 12 hundreths of a pound neet, is equal to 1lb. groſs.

Characters to be obſerved in this Rule.

T. Ton. C. Hundred. lb. Pounds. t. Tenths.
h. Hundreth. th. Thouſenth.

			t.	
2	hundred groſs	is	,1	tenth of a ton.
4		is	,2	
6		is	,3	
8		is	,4	
10		is	,5	or half a ton.
12		is	,6	
14		is	,7	
16		is	,8	
18		is	,9	
20		is	1,	ton.

			lb. t. h. th.
1,	Ton,	is	2000,
,1	Tenth,	is	200,
,01	Hundreth,	is	20,
,001	Thouſenth,	is	2,
,0001	Ten thouſenth,	is	,2
,00001	Hundred thouſenth,	is	,0 2
,000001	Millienth,	is	,0 0 2

Sums for working.

C. t. h. th.	C. t. h.th	T. t. h.th.	T.t. h.
,75	4,134	8,425	,75
,5	3,876	9,5	,5
,25	5,603	6,675	,25
,125	1,79	4,345	,125
,675	6,5	5,103	,0625
,844	8,075	7,25	,03125
,76	7,75	3,075	,675
,99	8,25	2,75	,999
,479	2,125	7,849	

If you would wiſh to work by hundred weights, without uſing the ton, you muſt obſerve that the third figure to the left in entire pounds is always an hundred or hundreds, that is, hundreds are hundreds, and the place of tens is tenths, and the place of units is hundreths.

Examples for working.

C.	lb.
467,	46
343,	37
67,	15
76,	75
193,	61
782,	52

or thus,

C.	t.	h.
467,	4	6
343,	3	7
67,	1	5
76,	7	5
193,	6	1
782,	5	2

TROY WEIGHT.

By this Weight is weighed, Gold, Silver, Medicines, &c.

I have taken the ſame liberty as in the other weights and reduced it to a Decimal State.

The following Characters muſt be obſerved.

L.	Pound.
t.	Tenth.
h.	Hundreth.
th.	Thouſenth.
tth.	Ten Thouſenth.

		pw. t. h. th. tth.
1. ounce,	is	20,
,1	is	2,
,01	is	,2
,001	is	,0 2
,0001	is	,0 0 2
,00001	is	,0 0 0 2

	oz. t. h. th. tth.	oz. pw. gr. t. h. th. tth.
1, Pound,	12, is	
,1 Tenth,	1, 2	1 4
,01 Hundreth,	,1 2	0 2 9 ,6
,001 Thouſ. is	,0 1 2	6 ,3
,0001 Ten Thouſ.	,0 0 1 2	,6 3
,00001 Hun. T.	,00 0 1 2	,0 6 3
,000001 Milſie.	,00 0 0 1 2	,00 6 3

Examples for working.

L.	L. t. h.	oz. t. h.	oz. t. h. th. tth.
46,	420, 7 5	1, 7 5	0, 2 5 6 7
74,	309, 2 5	2, 5	, 3 4 2
67,	104, 5	3, 2 5	, 5 2 8 9
35,	642, 1 5	6, 0 4	, 8 9 4 1
20,	230, 3 5	0, 7	, 7 3 2 8
94,	791, 5 5	9, 0 9	, 4 7 9 4
73,	302, 5 6	2, 4 5	, 1 0 0 5
29,	800, 6 3	8, 7 3	, 7 0 9
82,	94, 7	5, 9 9	, 0 4 3 2
			, 8 6 7 3

L.	L. t. h.	L. t. h. th.	L. t. h. th.
24,	4, 6 4	461, 3 6 4	, 3 1 9
65,	7, 4 1	672, 4 7 5	, 1 2 72
72,	8, 7 5	947, 1 4 1	, 2 3 33
96,	3, 5	573, 5 5 5	, 4 4 44
16,	5, 2 5	824, 7 2 5	, 5 6 55
40,	2, 1 1	330, 5 6 4	, 6 5 66
71,	6, 9 5	502, 3 7 5	, 7 8 272
83,	9, 7 9	714, 6 6 4	, 8 9 856
64,	74, 9 9	142, 7 5 6	, 9 7 197

CLOTH MEASURE.

1, Yard,	,2 5 hundreths is 1 fourth.
,1 Tenth,	,5 tenths is 1 half.
,01 Hundreth,	,75 hundreths is 3 fourths.
,001 Thouſenth,	1, yard.

Characters. Y. yards, t. tenths, h. hundreth. th. thouſenth, I. inches.

Examples for working.

Y. t.
,1
,2
,3
,4
,5 } Tenths.
,6
,7
,8
,9
1,

Y. t. h.	Y. t. h.
8, 5	32, 7 5
9, 7 5	94, 5
4, 2 5	63, 6 3
3, 3	97, 2 5
2, 4	33, 9 9
1, 5	40, 8
7, 9 9	9, 1 1

Y. t. h. th.		I. t. h.
1, Yard	is	36,
,1 Tenth	is	3, 6
,01 Hundreth	is	, 3 6
,001 Thouſenth	is	, 0 3 6

Y. t.	Y. t. h.
140, 1	0, 4 5
264, 2	, 1 3
97, 3	, 2 5
83, 4	, 3 6
29, 5	, 5 7
70, 6	, 6 8
109, 7	, 8 1
420, 8	, 9 9
508, 9	

Wine Meaſure.

One gallon this meaſure, contains 230 cubic or ſolid Inches.

By this meaſure all Wines and diſtilled Liquors are ſold.

Characters. G. gallons, t. tenths, h. hundreths, th. thouſenths, I. Inch.

		I. t. h.
1, Gallon	is	230,
,1 Tenth	is	23,
,01 Hundreth	is	2, 3
,001 Thouſenth	is	, 2 3

The parts of a Gallon in Cubic Inches.

G. t.		I.	t. h.		I.t.	t. h.th.		I.t.h.
,1	is	23,	,0 1	is	2,3	,0 0 1	is	,2 3
,2		46,	,0 2		4,6	,0 0 2		,4 6
,3		69,	,0 3		6,9	,0 0 3		,6 9
,4		92,	,0 4		9,2	,0 0 4		,9 2
,5		115,	,0 5		11,5	,0 0 5		1,1 5
,6		138,	,0 6		13,8	,0 0 6		1,3 8
,7		161,	,0 7		16,1	,0 0 7		1,6 1
,8		184,	,0 8		18,4	,0 0 8		1,8 4
,9		207,	,0 9		20,7	,0 0 9		2,0 7
1,		230,	,1 0		23,0	,0 1 0		2,3 0

G.	G. t. h.	G. t. h. th.
46,	139, 5	0, 1 2 5
74,	256, 7 5	, 2 5 5
93,	372, 2 5	, 7 0 6
67,	465, 9 9	, 4 6 1
80,	970, 4 4	, 5 5 5
72,	400, 6 3	, 2 6 7
33,	149, 7 3	, 8 2 4
27,		, 9 4 7

Beer Meaſure.

One gallon of this meaſure, contains 282 cubic Inches.

By this is meaſured all kinds of Beer, Cider, Perry, Milk, &c.

Characters to be obſerved. G. gallon, t. tenth, h. hundreth, th. thouſenth, I. Inches.

		I. t. h. th.
1, Gallon,	is	282,
,1 Tenth,	is	28, 2
,01 Hundreth,	is	2, 8 2
,001 Thouſenth,	is	, 2 8 2

t.		I. t.	t. h.		I. t. h.
,1	is	28, 2	,0 1	is	2, 8 2
,2		56, 4	,0 2		5, 6 4
,3		84, 6	,0 3		8, 4 6
,4		122, 8	,0 4		11, 2 8
,5		141, 0	,0 5		14, 1 0
,6		169, 2	,0 6		16, 9 2
,7		197, 4	,0 7		19, 7 4
,8		225, 6	,0 8		22, 5 6
,9		253, 8	,0 9		25, 3 8
1,		282,	,1 0		28, 2 0

G.	G. t. h.	G. t. h.
427,	46, 2 5	0, 2 5
360,	72, 7 5	, 7 5
274,	21, 5	, 5
195,	30, 9 9	, 4 5
672,	47, 0 2	, 0 9
824,	64, 1 6	, 9 9

Corn Meaſure.

By this is meaſured all kinds of Grain, viz. Wheat, Rye, Barley, Oats, Indian Corn, &c.

Characters to be obſerved. B. Buſhel, t. tenth, h. hundreth, th. thouſenth, I. inch.

The Buſhel contains, 2178 Cubic Inches.

		I. t. h. th. tth.
1, Buſhel	is	2178,
,1 Tenths	is	217, 8
,01 Hundreth	is	21, 7 8
,001 Thouſenth	is	2, 1 7 8
,0001 Ten Thouſenth	is	, 2 1 7 8

t. h. th.			I. t. h.
,7 5	Three pecks,	is	1633, 5
,5	Half Buſhel,	is	1089,
,2 5	One peck,	is	544, 5
,1 2 5	Half peck,	is	272, 2 5

B. t.		I. t.
, 1	is	217, 8
, 2	is	435, 6
, 3	is	653, 4
, 4	is	871, 2
, 5	is	1089, 0
, 6	is	1306, 8
, 7	is	1524, 6
, 8	is	1742, 4
, 9	is	1960, 2
1,	is	2178, 0

B.	B. t. h.	t. h. th.
467,	46, 2 5	,3 4
940,	32, 5	,6 4
704,	74, 7 5	,7 5
142,	26, 3 3	,6 8
678,	93, 0 4	,9 4
394,	20, 7	,3 9 9

Lineal Meaſure.

This meaſure pertains to length, without bredth. As Degrees, Miles or Minutes, Rods, Feet, Inches, &c. which, I with all other Rules, conſider decimally.

Characters to be obſerved. Dg. Degree, M. Miles or Minutes, R. Rods, F. Feet, I. Inches.

One Degree is 62 Statute Miles, and 55 hundreths of a Mile.

This calculation makes the Globe 25020 Miles in circumference, or 400 degrees.

			Dg. t. h. th.
1,	Degree	is	62, 5 5
,1	Tenth,	is	6, 2 5 5
,01	Hundreth,	is	, 6 2 55
,001	Thouſenth,	is	, 0 6 255
,0001	Ten Thouſenth,	is	, 0 0 6255

I have proceeded to take the ſame liberty, relative to the Globe, as I have in all the foregoing Rules, reducing it to decimal proportion; and for conveniency, I divide the Globe into two hundred equal parts, by lines drawn from Eaſt to Weſt, at ten degrees diſtance from each other, containing ten of the forementioned diviſions or degrees, making one hundred ſuch degrees to each quarter of the Globe, each containing 62m. 5t. 5h. I likewiſe divide the Globe longitudinally, in the ſame proportion, dividing each degree into tenths, hundreths and thouſenths of a degree.

Thus I find 200 degrees of latitude from North to South, that is 100 degrees from the Equator, to the North Pole, and 100 to the South Pole.

Longitude muſt remain without diviſion, for want of an Equatoral Line, extending 400 degrees, from Eaſt to Weſt, quite round the Globe.

A TABLE ſhewing the Miles, from ,1 tenth of a degree to a degree. And from ,01 hundreth to ,1 tenth.

Dg. t.		M. t. h.	t. h.		M. t.h. th.tth.
,1	is	6, 2 55	,0 1	is	,6 2 5 5
,2		12, 5 1	,0 2		1,2 5 1
,3		18, 7 6 5	,0 3		1,8 7 6 5
,4		25, 0 2	,0 4		2,5 0 2
,5		31, 2 7 5	,0 5		3,1 2 7 5
,6		37, 5 3	,0 6		3,7 5 3
,7		43, 7 8 5	,0 7		4,3 7 8 5
,8		50, 0 4	,0 8		5,0 0 4
,9		56, 2 9 5	,0 9		5,6 2 9 5
1,		62, 5 5	,10		6,2 5 5

I now proceed to ſet down a few Sums for the exerciſe of the learner.

Dg. t.	Dg. t. h.	Dg. t. h. th.
4, 1	3, 7 5	11, 2 5 6
3, 4	4, 6 3	14, 3 6 2
6, 7	2, 3 5	13, 7 4 3
7, 5	5, 2 6	7, 3 5 1
3, 9	7, 5 1	6, 1 2 3
8, 8	8, 9 6	

Land Meaſure.

This Rule pertains to bredth, as well as length, and may be conſidered either in Miles and parts, Rods and parts, or Acres and parts.

Characters to be attended to :

Mi. Miles,		,t. Tenths,
R. Rods,	Ft. Feet,	,h. Hundreths,
A. Acres,		,th. Thouſenths,
Ch. Chain,		

Mi.	R. t. h. th.
1, Mile,	320,
,1 Tenth,	32,
,01 Hundreth,	3, 2
,001 Thouſenth,	, 3 2
,0001 Ten Thouſenth,	, 0 3 2
,00001 Hund. Thouſ.	, 0 0 3 2

100, Chains make 1 Acre.

F. t. h. th.	A. ch.
5280,	3, 14
528,	2, 36
52, 8	4, 72
5, 2 8	1, 94
, 5 2 8	———
, 0 5 2 8	12,16

Examples.

A. ch.	A. t. h.
146,35	33, 6 5
246,79	60, 3 6
360,11	16, 0 9
677,99	21, 8 9

Mi.	Feet, t. h. th. tth.
1, M. is	5280, Chain.
,1	528,
,01	52, 8
,001	5, 2 8
,0001	, 5 2 8
,00001	, 0 5 2 8

Tenths of a Mile.

Mi. t.		R. t.
,1	is	32,
,2		64,
,3		96,
,4		128,
,5		160,
,6		192,
,7		224,
,8		256,
,9		288,
1,0		320,

Rd.	is	Y. t. h. th. tth. ht.	is	F. t. h. th.
1,	is	5,5	is	16,5
,1	is	,5 5	is	1,6 5
,01	is	,0 5 5	is	,1 6 5
,001	is	,0 0 5 5	is	,0 1 6 5
,0001	is	,0 0 0 5 5	is	,0 0 1 6 5

F.		I. t. h. th.
1,		12,
,1	is	1, 2
,01	is	,1 2
,001	is	,0 1 2
,0001	is	,0 0 12

F. t.		I. t.
,1	is	1, 2
,2		2, 4
,3		3, 6
,4		4, 8
,5		6, 0
,6		7, 2
,7		8, 4
,8		9, 6
,9		10, 8
1,		12,

,25 a quarter of a foot. ,5 half a foot. ,75 three quarters of a foot.

The Mile Chain is F. 52,8 tenths, (and is divided into tenths) 100 Chains make one Mile in length, and ten thouſand one ſquare Mile.

The Acre Chain is F. 26, 4 tenths in length (and divided into tenths) 100 Chains make an Acre.

Examples for working.

					Lineal Mile.			Square Mile.	
Mi.	t.	Mi.	t.	h.	Mi.	Ch.	t.	Mi.	Ch.
14,	3	6,	7	5	34,	76	4	4,	0001
16,	5	7,	4	6	60,	12	1	6,	0024
17,	6	4,	1	4	19,	31	4	7,	0343
18,	1	3,	0	7	14,	00	6	8,	4672
29,	7	9,	9	5	13,	09	6	3,	9999
34,	9	8,	9	9	17,	70	9	1,	0999

R.	t.	h.	R.	t.	h.	th.	A.	Ch.	t.	A.	t.	h.	th.	tth.
34,	7	5	12,	1	4	6	47,	94,	5	6,	3.	4,	9	9
64,	2	3	74,	2	7	9	34,	42,	9	3,	6	9,	0	6
72,	7	1	65,	3	4	1	74,	20,	1	2,	7	1,	9	
18,	3	4	83,	9	7	4	52,	90,	2		,0	7,	0	5
71,	6	3	59,	1	0	2	91,	07,	8		;4	9	9	9

F.	t.	h.	F.	t.	h.
36,	1	2	144,	1	7
42,	7	1	370,	2	1
14,	2	9	824,	7	3
81,	3	1	73,	4	5
94,	7	2	86,	9	7

A TABLE ſhewing the ſquare Rods and parts of Rods of Ground from ,1 thouſeath of Acre to an Acre.

Tenths. Hundreths. Thouſenths. t. of Acres.

A. t.	R.	t. h.	R. t.	t. h. th.	R. t. h.	A. t. Ch
,1	is 16,	,0 1	is 1, 6	,0 0 1	is ,1 6	,1 is 10
,2	32,	,0 2	3, 2	,0 0 2	is ,3 2	,2 is 20
,3	48,	,0 3	4, 8	,0 0 3	is ,4 8	,3 is 30
,4	64,	,0 4	6, 4	,0 0 4	is ,6 4	,4 is 40
,5	80,	,0 5	8, 0	,0 0 5	is ,8 0	,5 is 50
,6	96,	,0 6	9, 6	,0 0 6	is ,9 6	,6 is 60
,7	112,	,0 7	11, 2	,0 0 7	is 1, 1 2	,7 is 70
,8	128,	,0 8	12, 8	,0 0 8	is 1, 2 8	,8 is 80
,9	114,	,0 9	14, 4	,0 0 9	is 1, 4 4	,9 is 90
1, 0	160,	,1 0	16, 0	,0 1 0	is 1, 6 0	1, is 1,00

The foregoing Table will alſo anſwer for exerciſe, for the Learner in adding.

Sums for Exerciſe.

A. t.	A. t. h.	A. t. h. th.	R. t. h.
4, 6	32, 7 5	147, 9 6 7	46, 9 4
5, 3	40, 9 9	470, 6 0 3	37, 4 3
7, 9	73, 2 5	563, 5 1 9	84, 7 1
8, 4	11, 3 3	231, 1 1 1	93, 3 6
1, 2	51, 5 5	381, 5 6 2	52, 6 1
3, 1	63, 9 7	674, 8 6 2	97, 5 5

Table of Yard Measure.

Y. t.		I. t.		t. h.		I. t. h.
,1	is	3, 6	is	,0 1	is	, 3 6
,2	is	7, 2	is	,0 2	is	, 7 2
,3	is	10, 8	is	,0 3	is	1, 0 8
,4	is	14, 4	is	,0 4	is	1, 4 4
,5	is	18, 0	is	,0 5	is	1, 8 0
,6	is	21, 6	is	,0 6	is	2, 1 6
,7	is	25, 2	is	,0 7	is	2, 8 8
,8	is	28, 8	is	,0 8	is	2, 8 8
,9	is	32, 4	is	,0 9	is	3, 2 4
1,	is	36,	is	1, 0	is	3, 6 0

Examples for working.

Y. t.	Y. t. h.
4, 3	24, 7 5
6, 7	37, 9 9
8, 9	40, 3 4
3, 5	52, 5 6
5, 8	75, 0 9
2, 9	91, 2 5
1, 2	10, 6

TIME.

This Rule may be conſidered as Years, Months, Weeks, Days, Hours, Minutes and Parts of Minutes.

Characters to be obſerved.

Y. Years.
Mo. or mo. Months.
W. or w. Weeks.
Da. or da. Days.
H. or h. Hours.
Mi. or mi. Minutes.
S. or s. Seconds.

A Table ſhewing the number of days contained in the tenth of a year, by tenths to a year.

Y. t.		Da. t.		M.t.
,1	*is*	36, 5	*is*	1, 2
,2		73,		2, 4
,3		109, 5		3, 6
,4		146,		4, 8
,5		182, 5		6,
,6		219,		7, 2
,7		255, 5		8, 4
,8		292,		9, 6
,9		328, 5		10, 8
1,0		365,		12,

Y.			M. t. h. th. tth. hth.
1,	Year,	is	12,
,1	Tenth,	is	1, 2
,01	Hundreth,	is	, 1 2
,001	Thouſenth,	is	, 0 1 2
,0001	Ten Thouſ.	is	, 0 0 1 2
,00001	Hund. Thouſ.	is	, 0 0 0 1 2

TABLES.

Y.		W.t.h.th.		Da.t.h. th.		H.t.h.th.
1,	is	52,	is	365,	is	8766,
,1		5,2		36,5		876,6
,01		,5 2		3,6 5		87,66
,001		,0 5 2		,3 6 5		8,766
,0001		,0 0 5 2		,0 3 6 5		,8766
,00001	is	,0 0 0 5 2	is	,0 0 3 65	is	,08766

Y.		Minutes t. h. th.		Seconds, t.h.
1,	is	525160,	is	31557600,
,1		52596,		3155760,
,01		5259,6		315576,
,001		525,9 6		32557,6
,0001		52,5 9 6		3155,7 6
,00001		5,2 5 9 6		315,576

The foregoing Tables may anſwer for ſo many ſums for adding for the exerciſe of the learner.

I have omitted the fractional part of the Solar Year, conſidering it to be of very little or no uſe in buſineſs.

Examples for adding.

Y.	Y. t.	Y. t. h.	Y. t. h. th.
467,	4, 4	46, 2 5	74, 3 6 5
138,	6, 5	70, 5	67, 7 0 9
276,	7, 6	29, 7 5	36, 0 9 2
347,	2, 4	36, 6 3	22, 0 0 8
649,	3, 2	72, 3	43, 4 6
562,	5, 7	33, 2 9	50, 9
260,	8, 6	67, 4 7	94, 3 7 1

Subtraction of Money.

I now come to treat of Subtraction. This is nothing more than taking a leſſer number from a greater, and ſhewing the remainder.

A. is indebted to B. 75 dollars, but ſtands ready
to pay him - 43 dollars, I now demand
what will remain due —
32

I proceed and ſay, three from five and there remains 2 beginning at the right hand, and then, four from ſeven and there remains 3, as in the caſe above. So I find there will ſtill remain due to B. 32 dollars, as in the caſe above.

To prove the above caſe I begin at the right hand, as in addition, and add the ſum paid, or ready to be paid, and the remainder together, ſaying, 2 and 3 is 5, and 3 and 4 is 7, which I find to be 75, the debt firſt owed to B. being 75 dollars ;

The whole ſum ſtands thus, Debt 75 dols.
Cr. 43
Due, 32
Proof, 75

Caſe Second.

		D.	d.	c.	m.
	C. borrowed of D.	6473,	2	1	4
of which	C. paid	4964,	7	4	2

Now I demand how much
ſtill remains due to D.

I begin at the right hand, ſaying, 2 from 4 and there remains 2, and then 4 from 1 I can't, but I borrow 10, which I add to 1, makes 11, ſo I ſay 4 from 11 and there remains 7, then I carry the 1 ten that I borrowed to 7, and ſay, 1 that I borrowed to 7 is 8, eight from 2 I can't, but 8 from 12 and 4 remains, then 1 that I borrowed to 4 is 5, five from 3 I can't, but 5 from 13 and 8 remains, then 1 that I borrowed to 6 is 7, ſeven from 7 and 0 remains, then 9 from 4 I can't, but 9 from 14 and 5 remains, then 1 that I borrowed to 4 is 5, five from 6 and 1 remains.

I ſhall ſet the above ſum in manner following:

	D.	d.	c.	m.	
Borrowed,	6473,	2	1	4	
Paid,	4964,	7	4	2	
Due,	1508,	4	7	2	Anſwer.

The proof of this is found in the ſame manner as in Caſe Firſt.

This method of working anſwers without exception throughout the various denominations of Subtraction, for Anſwer and Proof.

I now proceed to ſet a few ſums for Exerciſe.

	D.	d.	c.	m.
Debt,	472,	2	4	1
Credit,	194,	0	7	2

	D.	d.	c.
Dt.	28,	7	4
Cr.	19,	3	7

	D.	d.	c.
Dt.	46,	4	
Cr.	25,	4	9

	D.	d.	c.	m.
Dt.	649,	7	9	
Cr.	97,	9	4	9

	D.	d.	c.	m.
Dt.	9,			
Cr.	,	4	7	3

	D.	d.	c.	m.
Dt.	64,	1	4	9
Cr.	36,	9	1	4

Subtraction of Avoirdupois or Neet Weight.

lb.	lb. t. c.	lb. t. h.th.
747,	69, 3 6	96, 9 4 3
260,	18, 6 5	77, 8 7 1

Of Neet Weight.

C. lb.	C. lb.	C. lb. t. h.
24, 64,	7, 56,	9, 33, 2 4
12, 94,	2, 75,	3, 51, 5

Great Hundred or Groſs Weight.

C. t. h.	C. t. h. th.	c. t. h.
14, 7 8	19, 3 4 6	17,
6, 4 9	16, 7 4 3	9, 7 5

I. t. h. th.	I. t. h. th.	I. t. h.th.
462, 7 5	64,	1, 6
329, 5 5 5	36, 9 9 9	, 7 8 4

Of Troy Weight.

L.	L. t. h.	L. t. h. th.	L. t. h. th.
367,	67, 4 5	326, 7 6 7	1,
230,	66, 5	97, 9 9 9	, 9 9 9

Subtraction of Cloth Measure.

Y. t. c. th.	Y. t.	Y. t. h.
467, 1 0 7	84, 4	492,
136, 4 7 2	29, 5	46, 3 5

Of Wine Measure.

G.	G. t. c.	G. t.	G. t. c.
364,	147,2 5	4, 5	34, 7 5
125,	94,7 5	1, 75	18, 5

Of Beer Measure.

G.	G. t. h.	G. t. h.
464,	374, 2 7	6,
127,	295, 7 5	1, 7 5

Of Corn Measure.

B.	B. t. h.	B. t. h.
64,	246, 2 5	461, 5
29,	87, 5	94, 7 5

Of Lineal Measure.

R. t. h.	M. t. h.	Dg. t. h.
478, 5	48, 8 4	74, 2 5
249, 7 5	31, 6 5	37, 7 5

Of Land Meaſure.

R.	R. t. h.	R. t. h. th.
394,	2768, 2 5	1493, 7 5 5
162,	196, 7 5	342, 9 2 5

The following are in Acres and parts of Acres.

A. ſtand for Acres.

A. t.	A. t. h.	A. t. h. th.
364, 2	7694, 2 5	1367, 9 6 7
147, 3	3763, 1 7	973, 1 2 9

A. Ch. t. h.	A. Ch. t. h.	A. Ch. t. h
372, 49, 3 4	947,	761, 00, 7 5
294, 73, 9 6	463, 74, 4 9	, 94, 6 9

The following are in Square Miles, and parts of Miles.

M. Ch.	M. Ch. t. h.	M. t. h. th. tth. t. h.
472, 0002,	32, 3678, 7 5	8, 5 1 3 4, 7 5
149, 0074,	17, 6739, 3 6	3, 0 0 0 9, 2 5

Of Time.

Y.	Y. t. h. th. tth.	Y. t. h. th.
346,	5740,	34, 2 5
149,	1799, 1 5 7 5	13, 6 7 8

MULTIPLICATION.

This Rule may juſtly be eſteemed the moſt valuable Rule in Arithmetic, on account of its great utility in the diſpatch of Buſineſs.

But before I proceed in this Rule, it is neceſſary to lay down the following TABLE, which ſhould be learnt by heart, back and forward ; when that is done the difficulty of learning the Rule is over.

Multiplication Table.

2		3		4		5		6	
2	4	3	9	4	16	5	25	6	36
3	6	4	12	5	20	6	30	7	42
4	8	5	15	6	24	7	35	8	48
5	10	6	18	7	28	8	40	9	54
6	12	7	21	8	32	9	45	10	60
7	14	8	24	9	36	10	50	11	66
8	16	9	27	10	40	11	55	12	72
9	18	10	30	11	44	12	60		
10	20	11	33	12	48				
11	22	12	36						
12	24								

7 follows, &c.

7		8		9		10		11		12	
7	49	8	64	9	81	10	100	11	121	12	144
8	56	9	72	10	90	10	110	12	132		
9	63	10	80	11	99	12	120				
10	70	11	88	12	108						
11	77	12	96								
12	84										

The foregoing TABLE begins with the Figure 2 at the top of the firſt column, and 2 under it, which I multiply together, ſaying, two times two is four, ſetting 4 to the right, at the top of the ſecond column.

Thus I proceed, ſaying 2 times 3 is 6, ſetting it to the right of 3. In the ſame manner I proceed thro' the Table.

When this Table is well learnt, by heart, you may proceed to work in this Rule, and until then it will be fruitleſs to attempt to proceed any further, as the whole Syſtem of Arithmetic entirely depends on the three firſt Rules, viz. Addition, Subtraction and Multiplication. Notwithſtanding what Mathematicians have ſaid relative to Diviſion being one of the fundamental rules on which the whole ſyſtem of Arithmetic depends, I think it cannot with juſtice be ranked among them, ſo long as it is performed by Multiplication and Subtraction, and is produced by the joint operation of theſe two Rules, by which the Quotient or Dividual is found.

I ſhall now proceed to ſet down Sums for working, to try the ingenuity of the learner ; and for conveniency ſhall place the ſmalleſt number for the Multiplier, in manner following.

Firſt, What is the product of 8, multiplied by 4 ?

8 Multiplicand,
4 Multiplier,
32 Product,

 5
4 | 8 Proof.
 5

Set your numbers as ſtated, and ſay, four times 8 is thirty-two, which ſet down as in the work.— Thus you find that the anſwer is thirty-two.

To prove this work, ſet down a mark as under the work, then, as there is but 8 in your Multiplicand, you will ſet it at the right of the mark, and but 4 in your Multiplier, you will ſet it at the left, againſt your Multiplicand, then add your Product, ſaying, 3 and 2 is 5, place 5 at the top of the mark, then multiply 4 and 8 together, ſaying 4 times 8 is 32, then find how many times 9 in thirty-two, you will find that 3 times 9 is 27, then ſubtract 27 from 32, and you will find that 5 remains, which place at the bottom of the mark; the number at top and bottom of the mark agreeing, is the Proof of the work.

Caſe Second.

What is the Product of 469, multiplied by 46?

$$\begin{array}{r} 469\\ 46\\ \hline 2814\\ 1876\\ \hline 21574 \end{array}$$

You muſt ſet down your Multiplicand and Multiplier as in Caſe firſt, and begin at the right, ſaying, 6 times 9 is 54, ſet the 4 under 6 in the place of unit, and carry 5 for the tens to the left, ſaying 6 times 6 is 36, and 5 is 41, ſet down 1 in the place of tens, and carry 4 to the left, then ſix times 4 is 24 and 4 is 28, ſet down 8 in the place of hundreds and 2 to the left, in the place of thouſands, thus you will find the Product of 469 multiplied by 6 to be 2814, then proceed to multiply by 4 which is four tens, beginning at the right of the Multiplicand, ſaying, 4 times 9 is 36, ſet

6 under 4 your Multiplier, and carry 3 to the left, ſaying, 4 times 6 is 24 and three is 27, ſet 7 in the place of hundreds, and carry 2, then 4 times 4 is 16 and 2 is 18, ſet 8 in the place of thouſends and 1 at the left. Thus you will find 469 multiplied by 4 tens or 40, to produce 18760. Add theſe two products together and you will find your final product to be 21574, ſo that you will find a ſatisfactory Anſwer to the above Queſtion.

To prove the above or foregoing Anſwer, make a mark as in Caſe firſt.

Then begin with your Multiplicand and add to the right, ſaying, 4 and 6 is 10, and 9 is 19, caſt out the nines, and there remains 1, becauſe 2 times nine is 18, which ſubtract from 19 and 1 remains, which place at the right of the mark, then add your Multiplier, ſaying, 4 and 6 is 10, which is 1 over 9, caſt away the 9, and ſet 1 at the left. In the ſame manner add your Product, ſaying, 2 and 1 is 3 and 5 is 8 and 7 is 15 and 4 is 19, you will find 2 nines which caſt out and 1 remains, which place at the top, then proceed to multiply croſſways; ſaying, 1 time 1 is 1, which you muſt place at the bottom; and thus you will find the number at top and bottom of the mark will agree, which is the Proof of the Work.

After you have learnt Diviſion, you may prove Multiplication by Diviſion, by dividing your Product by your Multiplier, and if your Quotient agrees with your Multiplicand your Work is right, if not, you may know that either your Work or Proof is in error.

Examples for Exerciſe of the Learner.

Multiply 3678	Multiply 97961	Multiply 33475
by 394	by 7894	by 26715

What is the product of 6471120, multiplied
by 6397,

Multiply 17097,
by 120,

Multiply 80762
by 16471

I now proceed to the Decimal part of this Rule.—You muſt both multiply & prove your work as in prime or whole numbers. But be very particular in placing your Decimal point, or comma, between your prime and decimal parts.

When you have obtained your Product, you muſt count the number of decimal places in your Multiplicand, and Multiplier, and point off as many as you find in both, from your product; but in caſe you have not ſo many places in your product, you muſt add on to the left of your product Cyphers, until you have as many places as you found in both your Multiplicand and Multiplier, then place your point at the left.

The following may properly be called Multiplication of Money, from its rendering the amount of any number of Articles, multiplied by their given price, per article, hundred, or thouſand, as will appear by the Work.

I ſhall now ſet down a number of ſums for the Exerciſe of the learner, and work a few for example.

B. t.
What comes 37, 5 thirty-ſeven Buſhel & 5 tenths
of Wheat to at , 2 Dollars per Buſhel.
3
Proof, 2 | 6 75, 0 Anſwer, 75 Dollars.
3

B. t. h.
What comes 12, 2 5 to
at 2, 5 Dols. 5 Dimes, per Buſhel.

7 6125
Proof, 7 | 1 2450
7
D.30,625 Anſ. 30 Dols. 625 Mills.

B. t. h.
74, 7 5 Buſhels of Oats, at 25 cts. per Buſh.
,2 5

37375
14950

D. 18,6875 Anſwer.

Proof, lb. t. h.
6 467, 2 5
7 | 6 , 0 7
6
Dol. 32,7075 Anſwer, 32 Dolls. 7 Dimes and three quarters of one cent.

I demand the amount of Yds.56 t.1 h.2 th.5 of Broadcloth, at D.4 d.2 c.5 per Yard.

I demand the amount of Yds.17 t.3 of linen, at ,55 Cents per Yard.

I demand the amount of G.127, t.7 h.5 of Rum, at ,74 Cents per Gallon?

I demand the amount of G.436, t.2 of Molaſſes, at ,62 Cents per Gallon.

I demand the amount of lb.16, 6t. of Butter, at ,15 Cents per pound ?

I demand the amount of C.6,49hund. of Cheeſe, at D. 6, 25c. per hundred.

C. t. h. D. d.
19, 7 6 of Lard, at 12, 4 per hundred.

C. t. h. th. tth. D. d. c.
14, 9 7 7 5 of Flour, at 3, 2 5 per hundred.

C. t. h. D. d.
7, 7 7 of Beef, at 4, 5 per hundred.

C. t. h. D. d. c.
3, 2 5 of Pork, at 5, 2 5 per hundred.

t. h. D. d.
,6 9 of Beef, at 4, 5 per hundred.

t. h. th. D. d. c.
,9 7 5 of Cheeſe, at 7, 2 5 per hundred.

,09lb. of Cheeſe, at D.7, 2d. per hundred.

Boards, Shingles, Brick and Tile, are commonly purchaſed by the thouſand ; in order to anſwer any queſtion of this nature, you muſt remove your Decimal-point, placing it between hundreds and thouſands, becauſe One hundred is One tenth of a thouſand.

D. d. c.
Example. What comes 5675 Bricks to, at 3, 7 5 per thouſand.

I

I place my point thus, 5,675 between 5 & 6, and
my given price under it, 3,75 and multiply as be-
fore, in the foregoing 28375
39725
Caſes in this Rule, 17025

D. 21,28125 Anſwer.

D. d.
What comes 3740 feet of Boards to, at 8, 5 per thouſand?

D. d. c.
What comes 1371 feet of Boards to, at 12, 2 5 per thouſand?

D. d. c.
What comes 9714 Shingles to, at 3, 2 5 per thouſend?

D. d. c.
What comes 467 Tile to, at 1, 1 2 per hundred?

D. d. c.
What comes 340 Tile to, at 12, 1 5 per Thouſand?

D.
What comes 96 feet of Boards to, at 11,25 cents per thouſand?

A. t. D. d. c.
What comes 14, 9 of Land to, at 17, 3 5 per A.

A. t. h. D. d. c.
What comes 127, 2 5 of Land to, at 21, 6 3 per Acre.

What comes ,75 hundreths of an Acre of Land to, at D.24,5d. per Acre?

What comes ,9 tenths of an Acre of Land to, at D.15,44 cents per Acre?

What comes ,06 hundreths of an Acre to, at D.34, per Acre?

lb. t. D. d.
What comes 796, 8 of Pork to, at 5, 7 per hundred? Place your point between tens and hundreds.

A Merchant, by reaſon of Loſſes, finds himſelf unable to pay his debts; finding them to amount to
D. d. c. m.
14749, 7 6 4, but his Creditors offer to compound with him, at ,54 cents on a dollar. Now I demand the amount of their propoſal?

lb. t. h. D. d. c.
What comes 1467, 2 5 of Pork to, at 4, 9 5 per hundred.

lb. t. D. d. c.
What comes 3769, 2 of Beef to, at 3, 2 3 per hundred.

lb. t. h. D. d.
What comes 5, 7 5 of Pork to, at 5, 6 per hundred?

lb. t. D. d. c.
What comes 9, 4 of Cheeſe to, at 7, 2 5 per hundred.

lb. D. d.
What comes 34 Flour to, at 2, 4 per hundred?

lb. t. D. d. c.
What comes 113, 3 of Flour to, at 2, 2 5 per hundred?

Rule of Simple Intereſt, and Commiſſions.

This Rule is no more than Multiplication, and performed in the ſame manner.

You muſt always be careful to place your Rate for Intereſt, or Commiſſions, at a due diſtance from component parts, placing a cypher, or cyphers according to the Rate of Intereſt, or Commiſſions, and your Decimal point.

I ſhall here place down ſome Tables to convey the idea more clearly, before I proceed to the Work.

,001	One tenth of a per cent.
,002	Two tenths of a per cent.
,003	Three tenths of a per cent.
,004	Four tenths of a per cent.
,005	Five tenths (or half,) a per cent.
,006	Six tenths of a per cent.
,007	Seven tenths of a per cent.
,008	Eight tenths of a per cent.
,009	Nine tenths of a per cent.
,01	One per cent.
,02	Two per cent.
,03	Three per cent.
,04	Four per cent.
,05	Five per cent.
,06	Six per cent.

,07	Seven per cent.
,08	Eight per cent.
,09	Nine per cent.
,1	Ten per cent.
,11	Eleven per cent.
,12	Twelve per cent.
,13	Thirteen per cent.
,14	Fourteen per cent.
,15	Fifteen per cent.
,16	Sixteen per cent.
,17	Seventeen per cent.
,18	Eighteen per cent.
,19	Nineteen per cent.

What is the Commiſſions on 179 Dollars, at ,001t. of a per cent ?

You have nothing to do in this caſe, but to remove your Decimal point from the right to the left of your dollars, as there is three places in your Multiplier, and but 3 in your Multiplicand ; and it will ſtand thus, ,179 one hundred and ſeventy-nine Mills ; which is the Anſwer to the Work.

What is the Commiſſions on 329 Dollars, at ,002
tenths of a per cent ? ,002

,658 Anſwer.

D. d.
What is the Intereſt of 2479, 5. at ,003 tenths, of a per cent, per annum ?

D. d. ct.
What is the Commiſſions, on 6075, 2 5 at ,004 tenths of a per cent ?

D. d. c.
What is the Intereſt of 14670, 7 7 at ,005 tenths of a per cent. per annum?

D. d. c. m.
What is the Commiſſions on 749, 9 9 9 at ,006 tenths of a per cent?

D. d. c. m.
What is the Intereſt of 300, 2 9 9 at ,007 tenths of a per cent. per annum?

D. d. c.
What is the Commiſſions on 940, 9 9 at ,008 tenths of a per cent?

D. d.
What is the Intereſt of 1607, 7 at ,009 tenths of a per cent. per annum?

D. d. c.
What is the Commiſſions on 790, 4 5 at ,01 per cent? In this caſe remove your Decimal point two places to the left, and it gives the Anſwer.

D. d. c.
What is the Intereſt of 674, 1 2 at ,02 per cent. per annum?

D.
What is the Commiſſions on 79, at ,03 per cent?

D. d. c.
What is the Intereſt of 94, 7 5 at ,04 per cent. per annum?

D.
What is the Commiſſions on 140, at ,05 per cent?

D. d. c.
What is the Intereſt of 29, 7 5 at ,06 per cent. per annum?

D. d. c. m.
What is the commiſſions on 961, 3 4 7 at ,07 per cent.

D. d. c.
What is the Intereſt of 67, 7 2 at ,08 per cent. per annum?

D. d. c.
What is the Commiſſion on 45, 7 9 at ,09 per cent?

D. d. c.
What is the Intereſt of 120, 3 4 at ,10 per cent. per annum?

D. d. c.
What is the Commiſſions on 43460, 2 5 at ,11 per cent?

D. d. c.
What is the Intereſt of 35474, 1 4 at ,12 per cent. per annum?

Rebate Intereſt.

In this Rule you firſt multiply your given Sum at Intereſt, by its Rate, whether it be 1, 2, 3, 4, 5, or 6, per cent. or any Rate required per annum. And that product by the time your given principal is at intereſt, and your laſt product will be your Anſwer to the Queſtion propoſed.

Example Firſt.

D.
What is the Intereſt of 150, at ,06 per cent. for
,5 tenths of a year? ,06
9,00
,5 Rebate Time.
Dollars, 4,500 Anſwer.

D. d. c.
What is the Intereſt of 76, 7 5 at ,06 per cent.
for ,3 tenths of a year? , 0 6
4,6050
,3 Rebate Time?
Dollars, 1,3815 Anſwer.

D. d. c.
What is the Intereſt of 679, 6 5 at ,06 per cent.
for ,25 hundreths of a year?

D. d. c.
What is the Intereſt of 247, 7 5 at ,07 per cent.
for ,99 hundreths of a year?

D. d.
What is the Intereſt of 136, 4 at ,08 per cent.
for ,8 tenths of a year.

D.

What is the Intereſt of 364, at ,05 per cent. for ,5 tenths of a year?

D. d. c.

What is the Intereſt of 29, 7 6 at ,05 per cent. for ,75 hundreths of a year ?

D. d. c. m.

What is the Intereſt of 37, 7 9 6 at ,04 per cent. for ,95 hundreths of a year ?

D. d. c.

What is the Intereſt of 84, 6 3 at ,03 per cent. for ,9 tenths of a year ?

If the Queſtion be three and a half per cent. place your rate thus, ,035. If three and a quarter, ,0325. If three and three quarters, ,0375. In this manner you may add to any rate, from one to ten per cent.

Compound Intereſt.

In this Rule you muſt caſt your Intereſt, annually, and add your Intereſt to the Principal, and then caſt your Intereſt on the new principal, thus you muſt proceed annually, until it be diſcharged, making a new principal every year. If any principal runs over a year or years, you muſt work the fractional part by Rebate Time.

Example Firſt.

D.
What is the Intereſt of 165, at ,06 per cent.
Y. t.
per ann. for 1, 5 of a Y'r? ,06

9,90

D. 174,9 Int. & prin. 1 Y.
,06

10,494
,5 Rebate Time.
t. D.
Rebate Int. for ,5 of a Y. 5,2470 on the principal & Intereſt, as above.

	D. d.
Intereſt and principal for 1 Year	174,9
Intereſt for ,5 tenths of a Year	5,247
Total, Intereſt & Principal,	180,147

Example Second.

D. d
What is the Intereſt of 275, 5 at ,05 per cent. per annum, for 2 years 7 tenths of a year.

D. d. c.
What is the Intereſt of 351, 6 5 at ,04 per cent. per annum, for 3 years and 3 tenths of a year?

D. d. c.
What is the Intereſt of 763, 5 5 at ,03 per cent. per annum, for Y.4,95h. of a year?

D. d. c.
What is the Intereſt of 1546, 7 9 at ,07 per cent. per annum, for Y.5,99 hundreths of a Year?

D. t. h. th.
What is the Intereſt of 24672, 9 9 9 at ,065
Y. t. h.th.
Six and a half per cent. per annum, for 7, 9 9 9?

Board Meaſure, or Superficial Meaſure.

Suppoſe a Board be 15 Feet long, and ,9 tenths of a foot in width, what is its contents in feet and parts of feet?

N. B. You muſt always multiply the length by the width, or width by the length.

I ſet the numbers down in the following manner for multiplying:

15, feet,
,9 tenths.
13,5 Anſwer.

I now proceed, ſaying, nine times 5 is 45, ſetting down 5 and carrying the 4 tens to the left, then I ſay, 9 times 1 is 9 and 4 added is 13, which I ſet down to the left of 5, and the Product ſtands thus, 135, then I prick off the five thus, 13,5 becauſe my multiplier was ,9 tenths of a foot. I find my Anſwer 13 feet and ,5 tenths of a foot, or half a foot.

The proof of this work is the ſame as is ſhewn in the Firſt and Second Caſe in Multiplication of whole numbers.

F. t. F. t.
Suppoſe a Board be 12, 7 long, and 1, 2 wide; how many feet doth it contain? I ſet my numbers thus:

F. t.
12, 7 length.
1, 2 breadth.
———
15,24
———

I now proceed, ſaying, 12 times 7 is eighty-four, I ſet down 4 and carry 8, for the 8 tens, ſaying, 12 times 12 is 144 and 8 I add is 152, which I ſet at the left of 4. Then I count my Decimal places in my Multiplicand, and Multiplier, and find one in each, I prick off the two right hand figures in my product, which is 24, and find for Anſwer, 15, feet and ,24 hundreths; being almoſt one quarter of a foot, as appears in the above work.

F. t. F. t.
Suppoſe a Board be 17, 5 long, and 1, 6 wide, what is its contents? 1, 6 breadth.

———
1050
175
———
Feet, 28,00 Anſwer, 28, Feet.
———

F. t. F. t.
Suppoſe a Floor be 12, 6 by 11, 8 how many ſquare Feet doth it contain?

F. t.
Suppoſe the Front of a Houſe be 20, 4 in height,
F. t.
and 43, 3 in length; how many ſquare Feet will it contain in front?

F. t. F. t.
If a Window be 5, 1 by 3, 7 what number of Feet will it contain?

F. t. F. t.
If a Window be 4, 4 in height, and 2, 3 in width, what number of Feet doth it contain?

F. t. h. F. t. h.
If a Floor be 12, 7 5 in width, and 11, 4 6 in bredth; how many ſquare Feet doth it contain?

F. t. h. F. t.
If a Floor be 23, 9 4 and 22, 3 in bredth; how many ſquare Feet doth it contain?

Solid Meaſure.

By this Rule Timber, Digging, Liquids, &c. are meaſured.

To meaſure Timber you muſt multiply the bredth and depth together and that product by the length, and your Anſwer or Product will ſhew you the Feet and parts of Feet, ſuch piece of Timber contains.

Example Firſt.

If a piece of Timber be ,8 tenths by ,6 tenths ſquare, and 15 Feet in length, how many Feet doth it contain?

Bredth ,8
Depth ,6
,48
length 15
240
48
Feet 7,20

t. t. F.
,6 by ,4 & 12, length.
,6
,24
12,
F. 2,88

Example Second.

If a piece of Timber be
t. t. F. t.
,9 by ,7 and 12, 5 in length, what is its contents ?

t.
Bredth ,9
Depth ,7
,63
Length 12,5
315
756
Feet 7,875 Anſ.

F. t. t.
If a piece of Timber be 1, 5 broad and ,7 deep
F. t.
21, 8 long ; what is its contents in Feet ?

t. t. F. t. h.
If a piece of Timber be ,7 by ,3 and 24, 7 5
what doth it contain ?

t. t. h. F. t. h.
If a piece of Timber be ,4 by ,3 5 and 16, 7 5 in
length, what doth it contain in Feet ?

F. t. F. t.
If a load of Wood be 3, 2 high and 2, 7 in width,
F.
and 8, in length, how many Feet doth it contain ?

If a piece of Timber be tapering from one end to the other, you muſt take the bigneſs in the middle, in caſe you cannot come at the middle, take the bigneſs at each end, and add them together, and then halve the product and multiply by the length.

If your Timber be round, take the girt in the middle and divide it by 4, and multiply your quotient by its own number, and that product by the length.

If a piece of timber be three ſquare, take half the perpendicular, and multiply it by the baſe, and that product by the length.

SHORT DIVISION.

By this Rule, we are enabled to diſcover any number of equal ſhares of any quantity of Money, weight or meaſure, according to the quantity and number of perſons ſaid quantity is to be divided among. It likewiſe enables us to reduce large names into ſmall ones. It enables us to make any deduction that may be required, in proportion to the ſum or quantity given.

Short Diviſion is more expeditious, where your Diviſor does not exceed 12, than long Diviſion.

1 Dividend,
2 Diviſor,
3 Quotient.

Caſe Firſt. To divide 55 Dollars equally among 5 men; I ſet my numbers as follows, 5)55, I
11,
begin at the left, and ſay, five in 5, one, which I ſet under 5, and nothing remains; I ſay again, 5 in 5 once, which I ſet under the ſecond five, and I find there is no fraction remaining.

D.
I find the Work ſtands thus, 5)55,
11, Anſwer.

The anſwer is 11 Dollars per Man.

To prove this work, I place 5, my Diviſor, under the Quotient or Anſwer, and multiply, ſaying, 5 times 1 is 5, ſetting down 5, and again, 5 times 1 is 5 ſetting it to the left; thus I find the proof to anſwer to the ſum to be divided; therefore the work is right.

I demand 6 Men's equal proportion of 476 dollars?

I ſet it for working thus, 6)476,
79·333 Anſwer.

And ſay, 6 in 47 goes 7 times 6 is 42, which leaves 5. I ſet down 7 under 7, and conſidering the remaining 5 to be 5 tens or 50, I ſay, how many times 6 in 56, I ſay 9 times 6 is 54, therefore I place down 9 under 6, but find there is 2 remaining, which I call 2 tens, or 20, then I ſay 6 in 20 goes 3 times 6 is 18; I place down 3 but 2 remains, which I call as before 20, and ſay 6 in 20 goes 3 times 6 is 18; I place down 3, but 2 remains, which I call again 20, ſaying 6 in 20 goes 3 times 6 is 18, I place down 3 but 2 remains. I have now reduced the fraction ſo low, that I think it is not of value enough to proceed any further, as the reſult of the laſt operation produced but 3 mills per man, and was I to purſue the remainder it would never be exhauſted, but continue to produce the ſame Anſwer, (that is 3 and 2 or 20 remaining) I find each man's ſhare to be 79 Dollars
D. d. c. m.
and ,333 mills ſtanding thus, 79, 3 3 3

The Proof is found as in Caſe Firſt, with this difference, when you multiply the mills in the Anſwer you muſt add 2 to the remaining fraction ; ſaying 6 times 3 is 18 and 2 is 20, ſo that you will place down 0 and carry 2 to the left.

D. d. c.
Divide 372, 7 6 equally among 8 men.

Proceed as in whole numbers, both in dividing and proof.

D. d. c. m.
Divide 14604, 3 0 8 equally among 11 men.

d. c. m.
Divide ,9 4 7 equally among 12 men.
C. t. h.th.
Divide 54, 9 4 3 of Flour, equally among 6 Men.

C. t. h.th.
Divide 17, 1 3 1 of Pork equally among 5 men.

C. t. h. th.
Divide 7, 4 7 5 of Beef equally among 12 men.

A. t. h. th.
Divide 46731, 9 7 5 equally among 10 men.

A. t. h.
What is the 7th part of 321, 5 9 of Land ?

A. t. h.
What is the 5th part of 3, 6 5 of Land ?
C. t. h. th.tth
What is the 6th part of 4, 6 7 7 5 of Sugar ?

lb. t. h.
What is the 3d part of ,94 3 5 of Sugar ?

LONG DIVISION.

This method of Long Diviſion I think is beſt, where your Diviſor is more than twelve. This Rule enables us to make the ſame diſcoveries as ſhort Diviſion, the principal difference is the place of the Quotient, the ſubtractional part in ſhort Diviſion is performed in the mind, and in Long Diviſion it is placed down by the pen. Your Quotient in ſhort, is placed under the Dividend, and in long it is placed to the right.

1 Dividend,
2 Diviſor,
3 Quotient,
or Anſwer.

You muſt
Firſt ſeek,
Second bring down,
Third Multiply.

By this Rule you may diſcover any proportion required of the number or quantity given.

I proceed to the practical part of this Rule, and ſhall place down a number of ſums by way of Example.

Firſt, divide 6783, Dollars, into 13 equal parts; or among thirteen perſons.

I ſet down the numbers for working as follows:

```
  D.      D.  d. c. m.
13)6783, (521, 7  6  9
  65
  ——
   28
   26
   ——
    23
    13
    ——
    100
     91
    ———
      90
      78
     ———
     120
     117
     ———
       3
```

And beginning, how many times can I have 13 in 67? I ſay 5 times; then I multiply the Diviſor by 5 (placing the 5 in the quotient) ſaying 5 times 3 is 15; I place 5 under 7 and carry 1 to the left, ſaying 5 times 1 is 5 and 1 is 6, which I place under 6; then I ſubtract 65 from 67, ſaying, 5 from 7 and 2 remains, placing 2 under 5, then 6 from 6 and nothing remains, ſo I place nothing becauſe it is the left hand figure; then I bring down the next figure in the Dividend, placing it at the right of the 2; then I ſay, how many times 13 in 28, I find I can have it two times, placing 2 in the Quotient, I ſay 2 times 3 is 6, I place 6 under 8 and ſay 2 times 1 is 2, placing 2 under 2, then I ſubtract ſaying, 6 from 8 and 2 remains, which I place under 6, then I ſay 2 from 2 and nought remains, then I bring down my next figure in the Dividend, which is the laſt, placing it at the right of 2 and find 23, and ſay, 13 in 23 I find 1, placing 1 in the Quotient, and ſay 1 time 3 is 3, placing 3 under 3, then I ſay 1 time 1 is 1, placing 1 under 2, then I ſubtract, ſaying 3 from 3 and nought remains, placing 0 under 3, then 1 from 2 and 1 remains, placing 1 under 1, I find I have 10 remaining, which is a fraction ſtill to be divided. I find each man's ſhare to be 521, Dollars.

I now place a Decimal point at the right of 1, thus in the Quotient ſhewing the left of ſaid point to be Dollars, and proceed to bring out the Dimes, Cents and Mills, by placing a cypher at the right of the remaining fraction, which makes 100. I ſay, how many times 13 in 100? I find 7 times, therefore, I place 7 in the Quotient, and ſay, 7 times 3 is 21, I place 1 under the Dividend and carry 2 to the left, ſaying, 7 times 1 is 7 and 2 is 9, which I place under the ſecond cypher. Then I I ſubtract, ſaying, 1 from 0 I can't but 1 from 10 and there remains 9, which I place under 0, then 1 that I borrowed to 9 is 10, ten from 10 and 0 remains but leave blank, becauſe it is at the left. I place another 0 at the right, and ſay 6 times, then 6 times 3 is 18, place 8 under 0 and carry 1, ſaying, 6 times 1 is 6 and 1 is 7, which I place under 9, then ſubtract, ſaying 8 from 0 I can't, but 8 from 10 that I borrow and 2 remains, then 1 that I borrowed to 7 is 8, eight from 9 and 1 remains, which I place under 7, I find the fraction ſtill remaining to be 12; I place another cypher to the right, and it ſtands 120, then I ſay 13 in 120 will go 9 times 3 is 27, I place down 7 and carry 2, ſaying, 9 times 1 is 9 and 2 is 11, which I ſet to the left of 7, and ſubtract as before, finding 3 remaining. I might proceed, but the remainder being of ſo ſmall value I ſtop, leaving but 3 Mills to be divided among 13 perſons.

The Proof is found as in ſhort Diviſion, by multiplying the Quotient by the Diviſor, and adding the remaining fraction.

Caſe Second.

D. d. c. m.
Divide 397, 7 6 4 equally among 32 perſons.
I ſet it down as follows,
D. d. c. m.   D. d. c. m. t.
32) 397, 7 6 4 (12, 4 3 0 1 Anſwer.
32

77
64

137
128

96
96

40
32
---
(8)

D. d. c.
Divide 1472, 3 4 equally among 124 Perſons.
What is the 56 part of 562?
What is the 16th part of 144?
What is the 19th part of 79?

This Rule is very uſeful in diſcovering the prices of a ſingle article, where goods, wares or merchandize, are purchaſed by the quantity.

For this purpoſe, you muſt divide the given price by the number of articles purchaſed; and your Quotient will be the price of one article.

Example Firſt.

If 8 yards of ſatin coſt D.11,75 cents, what will one yard coſt? Set down your numbers thus,

D. d. c.
Yards, 8)11, 7 5
Anſ. D. 1, 4 6875

In all caſes where your Diviſor does not exceed 12, work by ſhort diviſion; But if over 12, by long.

If 12 yards of Broadcloth coſt D.48, 64 cents, what will one yard coſt?

If 9 buſhels of wheat coſt D.14, 26 cents, what will one buſhel coſt?

If 14 buſhels of Barley coſt D.13, 48 cents, what will one buſhel coſt?

If 17 yards of Linen coſt D.8 25 cents, what will one yard coſt?

If 37 gallons of Rum coſt D.40, what will one gallon coſt?

If 64 pound of Sugar coſt D.8, 48 cents, what will one lb. coſt?

If 74 gallons of Brandy coſt D.88, 88 cents, what will one gallon coſt?

If 36 gallons of Gin coſt D.44, 48 cents, what will one gallon coſt?

If 48lb of Cotton coſt D.18, 4 dimes, what will one lb. coſt?

DEDUCT DIVISION.

This Rule ſhews an equal diſtribution or diviſion of any known or propoſed ſum or quantity, when any certain ratio or ratios is reſerved for any other purpoſe.

I have 645 dollars which is the equal property of A. B. C. and D. which they deſire me to divide equally among them, reſerving to myſelf 20 per cent. in the diviſion, for my good ſervices.

I place my numbers thus,

645, Dollars
,2
——
129,0 Reſerve.
——
4)516, Remainder.
129, Anſwer.
——

I firſt multiply the given ſum by 2, which repreſents 20 per cent. and find 129 Dollars to be 20 per cent. on the ſum propoſed, then I ſubtract 129 dollars from the whole ſum, 645 Dollars, and find 516 Dollars remaining, which I divide equally among the four men, and find each man's ſhare to be 129 Dollars. To prove this Rule, you muſt multiply your Quotient by your Diviſor, adding your fraction if any remains, then add to that Product your Reſerve; if it makes the ſum firſt given, your work is right; if not there is an error.

Divide 672 Dollars equally among 3 Men, reſerving ,10 per cent.

D. d. c.
Divide 1349, 7 3 equally among 7 men, deducting ,09 per cent.

D. d.
Divide 3140, 5 equally among 11 men, deducting ,08 per cent.

REDUCTION.

Reduction of Decimal Proportion is no more than placing a Cypher at the right of any entire number.

Suppoſe I would reduce a Dollar into Dimes, Cents and Mills.

I place the Dollar thus, 1, dollar, I now place for reducing it into its loweſt terms.

1, Dollar.
1,0 Ten Dimes.
1,00 One hund. Cents.
1,000 One Thouſ. Mills.

This you find is performed by placing a Cypher or Cyphers at the right of a dollar.

To reduce 1,000 One Thouſand Mills into Dollars, I place them in the following manner, and divide by ten.

10 1,000 Mills.
1,00 Cents.
1,0 Dimes.
1, Dollar.

I ſay 10 in 10 once, 10 in 0 no times; 10 in 0 no times, then 100 by 10, I ſay 10 in ten 1, 10 in 0 no times; then 10 in ten 1, I place a comma or Decimal point at the right hand, becauſe it was obtained by taking in the whole of the Dividend, and accordingly was placed under the laſt Cypher, of conſequence is the number ſought. Which was the number of Dollars in 1,000 Mills? I find there is but One.

To Reduce 4, dollars into dimes, place a cypher to the right and read 4,0 forty dimes.

Reduce 5, dollars into cents, place 2 cyphers to the aight, and read 5,00 five hundred cents.

Reduce 6, dollars into mills, place 3 cyphers to the right, and read 6,000 thouſend mills.

If it be to reduce any number of dimes, into dollars, prick off one cypher or figure at the right.

If the quotient be cents, prick off two places at the right.

If the queſtion be mills, prick off 3 at the right, and what remains at the left is dollars.

Reduce 75, dollars into mills.

Reduce 75000 cents into dollars.

Reduce 651 dollars into cents.

Reduce 34671, Dollars into Dimes.
Reduce 17096 Dimes into Dollars.
Reduce 1 Eagle into Cents.
Reduce 13 Eagles into Mills.
Reduce 130000 Mills into Dollars.

REDUCTION of the Federal Currency of the United States is ſo ſimple, that the foregoing Directions, and Examples, cannot fail of giving the learner a clear idea of this Rule.

To reduce the currency of Connecticut, Maſſachuſetts, Rhode-Iſland, New-Hampſhire, Vermont, Virginia & Kentucky into the Federal Currency of the U. States. If the Queſtion be in pounds or pounds and ſhillings, reduce the ſum into ſhillings and place your point at the right, then divide by 6, the number of ſhillings in a dollar, proceeding as in ſhort diviſion, placing your point at the right of ſhillings, and what you find on the right is dimes, cents or mills.

Caſe Firſt.

I demand the dollars, dimes, cents and mills, in
L.473-14s. Multiply by 20, divide by 6
20

6)9474,
Anſ. 1579, Dollars.

I demand the dollars, dimes, cents and mills, in
L.41
20

6)820,
136,666 Anſwer, and 4 the fraction.

To reduce dollars into the above currency of Connecticut, multiply your dollars, dimes, cents or mills, by ,3 adding in the half of your fraction, if any, becauſe one dollar is ,3 tenths of a pound, like currency.

I demand the pounds and ſhillings, in 1579 dollars, multiply by ,3 doubling your right hand figure in your product, to bring out your ſhillings,

D.1579,
,3

L.473.14 Anſwer and Proof as Caſe Firſt.

I demand the pounds, ſhillings and pence, in
D.136,666 Mills?
,3

L.40,9998 Anſwer. If you add half the remaining fraction of caſe ſecond, it gives the proof of the queſtion.

Reduce L.47.13s. into dollars, dimes, cents and mills.

Reduce L.327.9s. into dollars, dimes, cents and mills.

Reduce L.6794.11s. into dollars, dimes, cents and mills.

Reduce L.14356.19s. into dollars, dimes, cents & mills.

If the queſtion extends to pence, you muſt reduce the whole ſum into pence, and divide by the number of pence in a dollar, which is 72, in the foregoing currency.

Reduce D.647,764 mills into pounds.
Reduce D.3453, 64 cents into pounds.
Reduce D.7941,9 dimes into pounds.

Reduce D.823,26 cents into pounds.
Reduce D.139,99 cents into pounds.
Reduce D.130, into pounds.
Reduce D.93, into pounds.
Reduce 367647 mills into pounds.
Reduce 94677 cents into pounds.
Reduce 318 cents into the decimal of a pound.

To reduce the Currency of the State of New-York into Dollars ; you muſt reduce pounds into ſhillings, and if the Queſtion contains pounds and ſhillings you muſt add in the ſhillings ; and divide the product by 8 becauſe there is eight ſhillings contained in each dollar.

Caſe Firſt.

I demand the dollars, dimes, cents and mills, contained in L.73 multiply by 20 and divide by 8.
20

8)1460
Anſ. D.182,5 dimes.

The Proof is found by multiplying the product by the tenths of a pound contained in a dollar, which is four in the above currency.

Caſe Second.

I demand the pounds contained in D.182,5 dimes.
,4

Anſwer, L.73,00
and proof of Caſe Firſt.

Caſe Third.

I demand the dollars, dimes, cents and mills, in

L.325·17 ſhillings.

20

8)6517,

Anſwer, D. 814,625 mills.

,4

Proof, L.325,8500 eighty-five hundreths of a pound, is equal to 17 ſhillings.

Reduce L.64 into dimes, cents and mills.

Reduce L.93 into dollars, dimes, cents and mills.

Reduce L.375 into dollars, dimes, cents and mills.

Reduce L.471·13s. into dollars, dimes, cents and mills.

Reduce L.520·11s. into dollars, dimes, cents and mills.

Reduce L.233·19s. into dollars, dimes, cents and mills.

Reduce D.365, into pounds.

Reduce D.865, into pounds.

Reduce D.1475, into pounds.

Reduce D.6782,64 cents into pounds.

Reduce D.896,94 cents into pounds.

Reduce D.375,999 mills into pounds.

Reduce D.291,463 mills into pounds.

To find the ſhillings in any of the foregoing Caſes, multiply the fraction by 2, and you have the ſhillings, at the left of your point.

If there is ſtill a fraction remaining multiply ſuch remaining fraction by 12, and at the left of your point you have the pence.

And if there is yet a fraction remaining, multiply by 4, and you have the farthings at the left of your point.

To reduce the currency of the State of Pennſylvania into Dollars, dimes, cents and mills, you may reduce pounds or pounds and ſhillings, into ſhillings, and divide by s. 7,5 tenths becauſe a dollar is ſeven ſhillings and ſix pence in ſaid currency; but if the queſtion be pounds, ſhillings and pence, you muſt reduce the queſtion into pence and divide by 90, the number of pence in a dollar.

Caſe Firſt.

I demand the dollars, dimes, cents and mills, in L. 34, multiply by 20 and divide by 7,5

```
        20,
      ———  D.
  7,5)680,(90,666 mills, leaving ſtill a fraction 50.
      675,
   ————————
       50,0
       45,0
       ————
        500
        450
       ————
        500
        450
       ————
       (50)
```

the value of which is ſo ſmall I think it not worth reducing any lower. To prove this Caſe, multiply the quotient by the diviſor, adding the fraction, and it will give the proof of the work, if you ſtrike off the right hand Integer, and halve what remains at the left.

Reduce L. 743 17s. into Dollars, dimes, cents and mills.

Reduce L.97-19s. into dollars, dimes, cents and mills.

Reduce L.321-10s. into dollars, dimes, cents and mills.

Reduce L.12-7s. into dollars, dimes, cents and mills.

Reduce L.407-13s. into dollars, dimes, cents and mills.

Reduce L.31-10-6 into dollars, dimes, cents and mills.

Reduce L.20-6 8 into dollars, dimes, cents and mills.

To reduce dollars into pounds, you muſt divide your number of dollars, or dollars and cents, &c. by 4 and then by 8, ſetting your products or quotients directly under each other, add them together and point off your decimal places, and what you have to the left of your point will be pounds, and at the right the decimal parts of a pound; to bring out the ſhillings, multiply the fraction by 20, the number of ſhillings in a pound, point off the fraction, and the left is ſhillings; if there be a fraction ſtill remaining, multiply it by 12, the number of pence in a ſhilling, and place your point, and the left is pence; in the ſame manner by 4 ſhews the farthing.

Caſe Firſt.

I demand the pounds, ſhillings, pence and farthings

in 647, dollars.
4)161,75
8)80,875

L.242,625
20,

ſhil. 12,500
12

d. 6,0

Divide by 4 and 8—add your product or quotients and you have the Anſwer.

I find that 647, dollars is
L.242-12 6

The reaſon I divide the given ſum firſt by 4 and then by 8, is becauſe I find a dollar contains one fourth and one eighth of a pound.

Reduce 372, dollars into pounds, ſhillings and pence.
Reduce D.59, into pounds, ſhillings and pence.
Reduce D.2784, into pounds, ſhillings and pence.
Reduce D.76941, into pounds, ſhillings and pence.
Reduce D.365,4 dimes, into pounds, ſhillings and pence.
Reduce D.87,6 dimes, into pounds, ſhillings and pence.
Reduce D.409,25 cents, into pounds, ſhillings and pence.
Reduce D.97,85 cents into pounds, ſhillings and pence.
Reduce D.67,427 mills, into pounds, ſhillings and pence.
Reduce D.560,375 mills, into pounds, ſhillings and pence.
Reduce D.2,25 cents, to the decimal of a pound, and bring out the ſhillings and pence.

Reduce D.1,177 mills, to the decimal of a pound, and bring out the ſhillings and pence.

Reduce ,75 cents to the decimal of a pound, and bring out the ſhillings and pence.

To reduce Sterling Money into Dollars, Dimes, Cents and Mills.

You muſt reduce the given ſum, according to the nature of the queſtion, as in the foregoing work.

I demand the dollars, dimes, cents and mills in

```
    L.7,             multiply by 20 and divide by 4,5
     20   D. m.
4,5)140,(31,111  becauſe I find a dollar to con-
     135,        tain 4 ſhillings and 6 pence, ſix
     ----
      50         pence being half a ſhilling.
      45
      ----
      5,0         I find L.7 to be D.31,111 mills,
      4,5
      ----
       50         and 5 the remaining fraction.
       45
       ----
        50
        45
        ----
        (5)
```

Reduce L.27-5s. into dollars, dimes, cents and mills.

Reduce L.347-13s. into dollars, dimes, cents and mills.

Reduce L.2671-19s. into dollars, dimes, cents and mills.

Reduce L.301-10s. into dollars, dimes, cents and mills.

Reduce L. 1-17s. into dollars, dimes, cents and mills.

Reduce L.0-16s. into dollars, dimes, cents and mills.

Reduce L.37-13-9d. into dollars, dimes, cents and mills.

Reduce into pence and divide by 54, the number of pence in a dollar.

Reduce L.64-11-6d. into dollars, dimes, cents and mills.

The eaſieſt method to reduce dollars, or dollars, dimes, cents and mills, into pounds, is to divide the given ſum by the parts of a pound contained in a dol.

s. d.
I find 2 6 to be one eighth, and 2s. to be one tenth of a pound, which make four ſhillings and ſix pence, being the value of a dollar Sterling.

Caſe Firſt.

Divide by 8 and 10, and work as in the currency of Pennſylvania.

I demand the pounds, ſhillings and pence, in

8)36, Dollars.
10) 4 5
3,6
L.8,1
,20
S. 2,0 Anſwer, L.8 2s.

I demand the pounds, ſhillings and pence, in

8)697, Dollars,
10) 87,125
69,7
L.156,725
20,
S.14,500
12,
d. 6,0

Anſwer, L.156 14-6d.

Reduce D.347, into pounds, ſhillings and pence.
Reduce D.7641, into pounds, ſhillings and pence.
Reduce D.909, into pounds, ſhillings and pence.
Reduce D.1647, into pounds, ſhillings and pence.
Reduce D.35,49 cents, into pounds, ſhillings and pence.
Reduce D.194,63 cents into pounds, ſhillings and pence.
Reduce D.304,95, cents into pounds, ſhillings and pence.
Reduce D.6460,469 mills into pounds, ſhillings and pence.
Reduce D.36,475 mills, into pounds, ſhillings and pence.
Reduce D 2,96 cents, to the decimal of a pound.
Reduce D.1,479 mills, to the decimal of a pound.
Reduce D. ,96 cents, to the decimal of a pound.
Reduce D. ,392 mills, to the decimal of a pound.
Reduce 1 pound Avoirdupois into thouſenths of a pound, one thouſenth of a pound bears the ſame relation to a pound as one mill does to a dollar, one hundreth, that of a cent, one tenth that of a dime.

The above proportion holds good, whether your ſuppoſed or real integer be a ton, hundred, pound or ounce ; a year, month, week, day, hour, or minute ; a mile, chain, yard, rod, foot or inch ; a gallon, quart, pint or gill ; or any other propoſed or real integer whatever.

Having now explained the relation of the fraction to the real or propoſed integer, I proceed to place down ſome queſtions for the exerciſe of the learner.

Reduce 1, pound avoirdupois into thouſenths,
1,0 tenths,
1,00 hundreths,
1,000 thouſenths.

To reduce the above back to its original ſtate, or any other queſtion, when ſtated in thouſenth you muſt begin at the right hand cypher or figure, and count to the left, ſaying, thouſenth, hundreth, tenth, and place your decimal point at the left of the place of tenths, and what you find at the left of your point is the real or propoſed integer.

Reduce 14 lb. avoirdupois into hundreths.
Reduce 1400 hundreths of a pound avoirdupois into pounds.
Reduce 46785 lbs. avoirdupois into tenths of a pound.
Reduce 46785 tenths of a pound avoirdupois into lbs.
Reduce 46785 lbs. avoirdupois into hundreths.
Reduce 24 hundred weight into lbs.

The Golden Rule, or, Rule of Three direct.

This rule may well be called the Golden Rule, from its great utility in buſineſs.

In this rule, three numbers are given whereby the fourth is diſcovered.

I have found the following lines to be of great utility to the learner, when well copied by heart.

The Golden Rule hath numbers three,
The firſt and third muſt ſo agree,
That of one kind they both remain,
If to the fourth you would attain;
Then third and ſecond multiply,
Divide by firſt ingeniouſly:
So will your quotient be the ſame,
As you in ſecond place did frame.

You muſt alway be careful to arrange you numbers according to the above directions, and multiply the ſecond and third together, and divide the product by the firſt, and your quotient will be the fourth number or anſwer to the queſtion propoſed.

Queſtion Firſt.

If 100, dollars gain 6, dollars, what will 255, dollars gain at that rate.

```
If 100, D. G. 6, D. G.—255, D.  G.
                          6,
                        ——— D. d.
                   100)1530,(15, 3 Anſwer.
                       100
                       ———
                        530,
                        500
                        ———
                         30,0
                         30 0
                         ———
                           ,0
```

I place 6, under 255, and ſay 6 times 5 is 30, place 0 under 5, at the right, and carry 3, ſaying 6 times 5 is 30 and 3 is 33, place 3 under the ſecond 5, and carry 3, ſaying 6 times 2 is 12 and 3 is 15, which I place to the left, and find my product to be 1530, then placing my firſt number as above, I ſay 100, in 153 goes 1, which I place in my quotient, ſaying(multiplying my diviſor) once 0 is 0, placing it under 3, then once 0 is 0, then once 1 is 1, placing it under 1 at the left, then I ſubtract ſaying 3 is 3, bringing 3 down, then 5 is 5, bringing it down, then 1 from 1 and 0 remains, but do not place it down, becauſe it is at the left, now I bring down my cipher at the right, then I ſay how many times can I have 100 in 530? I ſay 5 times, placing 5 in the quotient, multiplying my diviſor, ſaying 5 times 0 is 0 and 5 times 0 is 0, then 5 times 1 is 5, placing them as in the work, then I ſubtract, ſaying 0 from 0 and 0 remains, then 0 from 3 and 3 remains, then 5 from 5 and 0 : I find a fraction remaining of 30, to the right of which, I place a decimal point as in the work, and to the right I place a cipher to bring out my dimes or tenths, placing a point at the right of 5, in the quotient, then I proceed ſaying, how many times 100 (my diviſor) in 300, I find 3 times, placing it in my quotient, ſaying, 3 times 0 is 0, then 3 times 0 is 0, then 3 times 1 is 3, placing the whole as in the work, then I ſubtract, and find nothing remaining, I bring down a cipher to ſhew the work to be finiſhed, I now find my quotient to ſtand thus, 15, 3, or 15 dollars and 3 dimes.

To prove this rule, you muſt ſtate the queſtion backwords.

D. d.
Saying, if 15, 3, intereſt require 255, dollars

principal, what principal will 6, dollars intereſt require ; if the anſwer be the firſt number propoſed as in this caſe, 100, dollars the work is right ; if not you may expect an error.

D. d. D. D.
If 15,3, I. 255, P. 6, I. require.
6,
——— D.
15,3)1530,(100, Anſwer or proof of queſtion firſt.
153
———
0, 0

I place an 0, at the right of the cipher brot down, to bring out the decimal place in the diviſor : Thus I find the two foregoing queſtions reciprocally prove each other.

If you carefully attend to the foregoing directions, you cannot fail of proceeding with ſafety in this rule.

If 50, dollars gain 5, dollars ; what will 134, dollars gain ?

D. d. D. d
If 55, dollars gain 3, 3, intereſt, what will 34, 6 gain at that rate ?

The foregoing queſtions may be anſwered by multiplication, without the aſſiſtance of diviſion, by ſtating your queſtion as in the foregoing caſes, and working as in rule of ſimple intereſt.

Caſe Firſt.

If 100, dollars gain 6, dollars, what will 255, dollars gain ?

D. D. D.
100, 6. 255,
,06

D. 15,30 Anſwer.

To prove queſtions of this nature, ſtate your queſtion backward, or reverſe your queſtion,

D. d.
Thus, if 255, dollars at ,06 per cent gain 15, 3, what will 100, dollars gain ?
,06

D. 6,00 Anſwer or proof.

You muſt be careful to multiply by your rate per cent.

If 100, dollars at 7 per cent, gain 7 dollars, what will 23 dollars gain ?

D. d. c.
If 35 dollars at 7 per cent gain 2, 4 5 what will 73 dollars gain ?

The following queſtions, muſt be performed as caſe firſt, in this rule.

If 23, yards of broad cloth, coſt D. 62, 7d. what will Yds. 36, 25h. coſt ?

If 13, buſhels of wheat coſt D. 21, 35 cents, what will B. 21, 7t. coſt ?

If 75, gallons of rum, coſt 85 dollars, what will 37 gallons coſt ?

If 96, buſhels of ſalt coſt 73, dollars, what will 42, buſhels coſt ?

If B. 35, 5 tenths of wheat coſt D. 49, 24 cents, what will B. 79, 9 tenths coſt ?

Thus, all irregular queſtions muſt be anſwered according to caſe firſt.

But if the queſtion begin by 10, 20, 30, 40, 50, 60, 70, 80, or 90, you may place your point at the left of units, or between units and tenths, in your third number, and multiply by your ſecond, and divide by your tens, whether it be 2, 3, 4, 5, 6, 7, 8, or 9 tens, as in ſhort diviſion, and your quotient will ſhew the anſwer.

Queſtion Firſt.

If 10 buſhels of wheat coſt 15, dollars, what will 75 buſhels coſt ? Place your point between [illegible] and 5 thus,

7,5 buſhels.
15, dollars.
———
375
75
———
Anſwer, D. 112,5 dimes.

In the above caſe there is but one ten in the firſt number, therefore there could be no diviſor, becauſe one will neither multiply nor divide.

If 20, buſhels of ſalt coſt 15, dollars, what will B. 79, 75 hundreths coſt ?

Remove your point thus, and multiply by ſecond and divide by firſt.

7,975
15,

39875
7975

2,)119,625
Anſwer D. 59,8125

If 30 lb. of ſugar coſt D. 3, 5 dimes, what will 373 lb. coſt?

If 30, gallons of brandy coſt D. 47, 36 cents, what will G. 132, 9 tenths coſt?

If 40, gallons of gin coſt D. 75,25 cents what will G. 13,5 tenths coſt?

If 50, lb. of beef coſt D. 1,27 cents, what will 473, lb. coſt?

If 60, lb. of butter coſt D. 9,36 cents, what will lb. 6,9 tenths coſt;

If 70, lb. of hemp coſt D. 11,57 cents, what will lb. 325,4 tenths coſt?

If 80, bricks coſt 45 cents, what will 4679 bricks coſt.

If 90 lb. of tanned leather coſt D. 17,78 cents, what will lb. 47, 4 tenths coſt?

The Double Rule of Three Direct.

In this rule you have five numbers given, by which you find the ſixth.

Queſtion Firſt.

If 100, dollars in 12 months gain 6, dollars intereſt, what will 150, dollars gain in 8 months? To prepare a queſtion for working in this rule, you muſt be careful to arange your numbers as above, then proceed to work, placing your firſt and ſecond numbers for multiplying into each other, and your fourth and fifth in the ſame manner, then work as in the Rule of Three Direct. I now place the above queſtion in form.

```
If 100, D.   12 Mo.   6, D.   150, D.   8Mo.
     12                            8
   ----                        ----
   1200,                       1200,
                                  6,
                               ---- D.
                         1200)7200,(6, Anſwer.
                              7200
                              ----
                                 0
```

This rule proves by reverſing the numbers as in the Rule of Three Direct.

```
      D.        Mo. G.   D. wt. will D. G.   Mo.
   If 150,        8       6,        100,      12
        8                            12
     ----                          ----
     1200,                         1200,
                                      6
                                   ---- D.
                            1200,)7200,(6,Ans.or
                                  7200    proof.
                                  ----
                                     0
```

D. d.
If 25, dollars in 12 months gain 1, 5, what will
D. d.
41, 6 gain in 14 months?

If 12, dollars in 1, year gain ,72 cents, what will 24, dollars gain in ,5 tenths of a year?

12, D. 1, Y. G. ,72 c. 24, D. G. in ,5 t. of Y.
,5
12,0
,72
24
84
12)8,64
,72 Anſwer.

When you have multiplied any two numbers into each other, you muſt count your decimal places in both your multiplicand and multiplier, and then count off as many places at the right of your product, as you found in both your multiplier and multiplicand, and place your decimal point.

When your ſecond number is 1, entire year, you have no need of ſetting it under the firſt number, as 1, will neither multiply nor divide.

If 50, dollars in 1, year gain 6, dollars intereſt,
D. d. c.
what will 73, 2 5 gain in ,95 hundreths of a year?

D. Y. G. D. D. d. c. t. h.
50, 1, 6,I. wt. will 73, 2, 5 G. ,9 5 Y.

,95

36625
65925

69,5875
6,

D. d. c. m. t.
50)417,5250(8, 3 5 0 5 Ans.
400

17,5
15,0

2,52
2,50

250
250

0

In this caſe, if I had ſtruck off the cipher from the diviſor, and dividend, and removed my decimal point, one place to the left, then divided by 5, my anſwer or quotient would have been the ſame.

To explain the above, I ſhall ſet the ſum down at the place of diviſion.

Thus, 5(0)41,7, 5 2 5(0
·8,3 5 0 5 Anſwer.

If you compare this product with the caſe above, you will find that they exactly agree.

D. d. c.
If 25, dollars in 1, year gain 1, 2 5, what will
D. 74,4d. 4c. gain in ,7 tenths of a year ?

If 100, dollars in 1, year gain 5, dollars, what will
D. d. c. m. Y. t. h. th.
575, 4 3 5 gain in 1, 4 9 9 at that rate ?

If 100, dollars in 1, year gain 4, dollars, what will
174, dollars gain in ,99 hundreths of a year.

The Single Rule of Indirect Proportion.

This rule differs in no reſpect from the Rule of Three Direct ; but, in aranging your numbers, it might be anſwered by that rule : This is principally to put the learner on trial, when the queſtion is erroneouſly ſtated, that he might be able to ſtate his queſtion according to rule for working.

For Examples.

How many dollars at ,03 per cent will raiſe 24, dollars.

G. P. G.
If 24, D. 100, D. 3, D.
100,

3)2400
Dols. 800, Anſwer.

To prove this rul e, I reverſe the queſtion thus :

Int.
If 800 D. gain 24, D. what will 100, D. gain ?
100,

8(00)24(00,
Dollars 3, Anſwer.

In this caſe, I ſtrike off the ciphers from the diviſor and dividend, and find 8/ for diviſor, and 24/ for dividend, then I ſay 8 in 24, goes 3 times.

D. d. c.
How many dollars at 5 per cent, will 375, 7 5 require.

D. d. c. D. D.
If 375, 7 5 100, 5,
100,

5)37575,00
Dollars 7515, Anſwer.

D. d. c.
A merchant owes 14175, 4 5 but by reaſon of loſſes, finds himſelf unable to pay his debts ; therefore he compounds with his creditors at ,54 cents on the dollar, how much is the whole amount that he pays ?

D. d. c.
If 1, D. be ,54cents what is 14175, 4 5
D. d. c. m.
Anſwer 7654, 7 4 3

The above queſtion may be ſolved by dividing the ſum or whole debt, by ,54 cents, or by multiplying the debt by ,54 cents, or per cent, pointing off the fraction.

The Double Rule of Indirect Proportion.

In this rule you muſt arange your numbers in ſuch order, that your ſecond and fourth numbers are of one denomination, and your third and fifth.

Then multiply your firſt ſecond and fifth together for your dividend, and your third and fourth for your diviſor.

Example.

If 50, dollars principal in 12 months gain 3, dollars intereſt, what principal will gain 14, dollars in 7 moths?

```
If 50, D.  12 Mo.  3, D.  7 Mo.  14, D.
  12                      3
 ———                     ———
  600,                    21
  14
  ———
  2400
  6
  ——— D.
21(8400(400, Anſwer.
  84
  ———
   00
```

The proof of this rule, is found by reverſing the queſtion as follows.

If 400, dollars principal in 7 months gain 14, dollars, what principal will gain 3, dollars in 12 months.

If 400, D. 7 Mo. 14, D. 12 Mo. 3, D.
7 12
—— ——
2800, 168,
3,
—— D.
168)8400,(50, Anſwer.
840
——0 I find the anſwer to be 50, doll

Thus I find the foregoing queſtions reciprocally p
ving each other.

The above method holds good thro' this rule.

If 75, dollars principal in 1, year gain D. 4, 5d.
tereſt, what principal will gain D. 24, 2d. 5c. inte
in ,5 tenths of a year?

D. d. D. d. c.
If 75,D. 1, Y. 4, 5 ,5 tenths Y. 24, 2 5,
24,25 ,5
—— ——
375 2,25
150
300
150
—— D. d. c. m. t.
2,25)1818,75(808, 3 3 3 3 Anſwer.
1800
——
1875
1800
——
75,0
67 5
——
7 50
6 75
——
750
675
——
750
675
—— 75 Remaining fraction:

Tare.

Tare is the weight allowed to purchaſers of goods, for the weight of caſks, boxes, bales, ſacks, &c. that any kind of Goods are weighed in.

Example Firſt.

If I purchaſe 6, hogſheads of ſugar, weighing
C. t. h. C. t. h.
64,6 9, and find that each caſk weighs, 1,2 5, which weight per caſk is to be deducted from the ſum total. I demand the whole tare to be deducted, and how much ſugar there remains?

C.t. h.	C. t. h.
1,2 5 Tare	64,6 9 in the groſs.
6, Caſks.	7,5 Tare to be deducted.
7,5 0	C. 57,1 9 Anſwer in ſugar.

In this rule I multiply the Tare of one caſk by the number of caſks, and ſubtract the product of the whole Tare from the groſs.

Barter.

By this rule, Merchants are enabled to barter or exchange their goods with each other, ſo that neither of them are liable to ſuffer loſs by the exchange.

Examples.

A and B Barter—A hath 17 yards of broad-cloth, that he will barter at D.3,7 5c.per Y.with B for ſatin at ,75 cents per Yard. Now I deſire to know how much ſatin B muſt give A, for his broadcloth.

I proceed as follows,

D.d. c.
If ,1 yard coſt 3,7 5 what will 17, yards coſt ?
1 7
———
26 2 5
37 5
———
Dollars 63,7 5 Anſwer.

I firſt find how much A's broadcloth comes to, and then proceed as follows,

If,75 cents will purchaſe 1,Y.of ſatin,what willD.63, 7 5c. purchaſe? being the amount of A's broadcloth.

I divide by ,75 cents,the price of one yard of ſatin.

,75)63,7 5(85, Anſwer yards.
60 0
———
3 7 5
3 7 5
———
0

I proceed by the Rule of Three Direct and find 85, yards of ſatin, to be equal to 17, yards of broadcloth.

The proof of this rule is found by reverſing the queſtion thus, you muſt take your quotient, for your firſt number.

Example.

D. d. c.
If 85, yards of ſattin coſt 63,7 5 what will 1, Yd. coſt?
D. d. c.
85,)63,7 5(,75 cents, anſwer.
59 5
425
425
0

How much ſugar at D. 9, 3 4 c. per hundred muſt C give D for 120, gallons of rum at D. 1, 2 5c. per gallon. D. d. c.
If 1, G. coſt 1, 2 5 what will 1 20, gallons coſt?
1,25
6 00
144
I divide by the price of 1, C. of D. d.c. ſugar; If 9, 3 4 purchaſe 1, C. C. t. h. th. tth.
9,34)150,00(16, 0 5 9 9
93,4
56 60
56 04
56,00
46 70
9 300
8 406
8940
8406
534

D. d. c.
In the firſt place, I find that 120 gallons at 1, 2 5
comes to 150, dollars ſtanding thus, 150,00 as above,
D. d.c.
which product I divide by 9, 3 4 the price of 1, C. of
ſugar, and find C muſt give D. C. 16,0599 mi. for his
rum.

How much flour at D. 1, 5 6c. per hundred muſt E. give F. for 72, buſhels of ſalt, at ,59 cents per buſhel?

How much flax at ,09 cents per pound muſt G give H for 9, yards of chints at D. 1,0 6 c. per yard?

How much ginger at ,25 cents per pound, muſt I give J for C. 1, 2 7 h. of pepper at D. 42,6 5 c. per hundred?

Single Fellowſhip.

Suppoſe a certain number of perſons joining ſtock, and trading until they have either loſt or gained a certain ſum of money, and then ſhews the equal diviſion of ſaid ſum, among the proprietors according to their ſtock.

D. d. c.
A and B, join ſtock, A put in, 794, 6 4 B put in
D. d. c. D. d. c.
329, 2 5 and they trade 'til they gain, 841, 6 1 now I
demand each man's ſhare according to his ſtock?

I firſt place down each man's ſtock.

D. d.e.
A's 794,6 4
B's 329,2 5

Whole ſtock, 1123,8 9

I now add them together for my firſt number, then ſtate my queſtion as in the Rule of Three Direct, ſaying,

D. d c. D. d.e. D. d.c.
If 1123,89 g. 841,61 wt will A's 794,64 gain?
841,61

79464
476784
79464
317856
635712

D. d.e m.r.
1123,89)668776,9704(595,055 5 A.
561945

1068319
1011501

568187,
561945

6242,04
561945

622 590
561 945

60 6450
56 1945

4 4505

N. B. The firſt number muſt always be the whole ſtock, the ſecond the whole gains, the third muſt be one of the proprietor's ſtocks, you muſt work ſeparately to find every man's ſhare of the gains, ſtating your queſtion for every proprietor, and bringing out his ſhare according to his ſtock. Again I ſay,

D. d.c. D. d.c. D. d.c.
If 1123,89 g. 841,61 wt will B's 329,25 gain ?

```
                329,25
              ————————
                420805
               168322
              757449
             168322
            252483
            ——————————— D.d.c.m.r.
1123,89)277100,0925(246,55 4 4 Anſwer.
        224778
        ——————
         523220
         44955 6
         ———————
          7366 49
          6743 34
          ———————
           62315,2
           56194 5
           ———————
            6120 75
            5619 45
            ———————
             501 300
             449 556
             ———————
              51 7440
              44 9556
              ———————
               6 7884
```

The proof of this rule, is found by adding each man's ſhare of the gains together, and if the whole of the ſhares added amounts to the whole gains before it was divided, your work is right, if not there is an error.

	D. d.c.		D. d.c.m.r.
A's ſtock,	794,64	Gains,	595,05 5 5
B's ſtock,	329,25		246,55 4 4
		Proof,	841,61 0 0

I add one for the fractions which makes the above proof.

A, B, C & D, join ſtock and trade, A put in D. 74,5 d. B, D.96,7 5 c. C, D.130, 2 5 c. and D, D.174, and they trade until they gain D.547,4 6 c. Now I demand each man's ſhare of the gains according to their ſtock.

A, B, C, and D, join ſtock and trade, A put in D.65,3 2c. B, D.72, and C D.86,5d. and they trade 'til they loſe 120, dollars.

I demand each man's ſhare of the loſs according to his ſtock.

Double Fellowſhip.

Suppoſe a certain number of perſons joining ſtock, and trading for ſome fixed time, and upon an examination of their ſtock, find they have either gained or loſt a certain ſum, which they deſire to divide among them according to each perſons ſtock and time.

Example Firſt.

A, B, and C, join ſtock and trade for 1, year, but at the end of ,6tenths of a year, D, joins them, and continues to the expiration of ſaid term.

The queſtion cannot be ſtated until each perſons ſtock is aſcertained.

A put in 59, dollars for 1, year, B, 64, dollars for 1, year, C 87, dollars for 1, year, and D 160, dollars for ,4 tenths of a year, and they gain 325, dollars. Now I deſire to know each perſons ſhare of the gains?

In the firſt place you muſt multiply each perſons ſtock by its time, and then add the ſeveral Products together, for your firſt number or diviſor, then ſtate your queſtions as in the Rule of Three Direct, making as ſaid before the ſum of their whole ſtock and time, your firſt number or diviſor the whole gain, your ſecond number, and A's ſtock and time your third or laſt number; thus you muſt proceed, ſtating your queſtion to find every perſons ſhare of the gains.

To prove a queſtion in this rule, you muſt after you have found each perſons ſhare of the gains, ſet them down for addition, and add the ſeveral ſhares together, and if they amount to the whole gains before divided, your work is right, if not, there muſt be an error.

Queſtion Second.

E and F join ſtock, and trade, E put in 120, dollars, F D. 97,5d. at the end of ,5 tenths of a year, G put in D. 231, 2 5c. and at the end of ,75 hundreths, H put in 175, dollars more, and at the end of Y.2,5t. they diſſolved partnerſhip, and found they had gained D.679,2 5c. Now I demand each perſons ſhare according to his ſtock and time.

Queſtion Third.

I J & K join ſtock and trade, I, put in D. 244,7 5c. J put in D. 162, and K put in D. 341,7 5c. but at the
t. h.
end of ,8 5 of a year, K drew out D. 120 : And at
Y. t.
the end of 1, 5 they diſſolved partnerſhip, and found
D. d. c. m
they had gained 873,3 7 5 : Now I demand each perſons ſhare of the gains according to their ſtock and time.

Equation of Payment.

This rule ſuppoſes A to have made a contract with B, which is to be ſatisfied by two, three or four, different payments, or as many as the parties may chooſe.

Caſe Firſt.

A made a contract with B to the amount of 300, dollars, which was to be fulfilled as follows : 100, dollars prompt, 100, dollars in ,3 tenths of a year, and 100, dollars in ,6 tenths of a year, but, upon conſidering the matter, they both agreed that the whole debt ſhould be ſatisfied at one equated time.

Now I demand an equated time, when the whole debt may be ſatisfied, ſo that neither may ſuſtain loſs or damage.

In this rule in the firſt place for your prompt pay, you muſt cut off your right hand cipher or figure, by a decimal point, then proceed to multiply the remaining payment or payments, by its or their particular time or times, then place your ſeveral payments in order for addition, add them together, and take their product for your dividend, and the ſum total of the contract for your diviſor, and the quotient found by the operation of the foregoing diviſor and dividend, will be your anſwer.

For the better underſtanding this rule I ſhall here work out the firſt caſe at large.

```
D. 100, prompt,                 10,0
   100, at ,3t. of a year,      30,
   100, at ,6t. of a year,      60,
   ———                          ———Y.t.h.th.tth
                                       ═══════
   300,                 300,)100,0(0,3 3 3 3  Anſ.
                                       ═══════
   ———                       90 0
D. 100,                      ———
   ,3                        10 00
   ———                        9 00
   300                        ————
   ———                        1 000
D. 100,                         900
   ,6                           ———
   ———                         1000
   60,0                         900
                                ———
                                100
```

The proof of this rule may be found by caſting the intereſt on the ſtipulated payments by their ſtated term, adding them together for the full intereſt to be paid on the whole contract, and caſting the intereſt on the whole contract for the equated term, and if they both agree your work is right, if not, there is an error : But in all caſes of prompt pay, you muſt ſtrike out all the decimal parts of the equated time to the right of tenths of years,becauſe you had for conveniency inworking,removed by your decimal point,the place of unit to the place of tenth of unit, in your prompt payment. I have in the foregoing example, eraſed all my decimal places to the right of tenths of a year, that the learner may the better underſtand the nature of the work.

Example Second.

A was indebted to B, D. 674, which A agreed to pay B in 4 payments, viz. D. 104, in ,2 tenths of a year, D. 200, in ,5 tenths, D. 236, in ,9 tenths of a year, and D. 134, in 1, year and 3 tenths : Now I demand an equated time when A ſhould have paid B, ſo that neither of them ſhould have ſuſtained loſs.

ERRATA.

Page 14. Line 4 from the bottom, the point ſhould be at the right of dollars.
29. Firſt line of the table, under Lineal Meaſure, read 1, degree is M. 62,25 hundreths.
32. Line 9th eraſe the word Chain.
34. Line 5th, remove R. t. h. A. t. one letter to left.
47. Line 2d from bottom place the point at the right of the multiplier.
94. Laſt caſe, omit Diviſor and read by Multiplication.

COOK's

AMERICAN ARITHMETIC.

Second Part.

OR,

AMERICAN SURVEYOR.

By DAVID COOK, JUN.

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M,DCCC.

To the READER.

I HAVE thought proper to preſent to your conſideration, the following plan of ſurveying, being ſatisfied in my own mind, that it muſt prove more expeditious than any thing of the nature hitherto publiſhed. It renders the art eaſy and intelligible to every perſon who hath a tolerable knowledge of numbers.

The whole is founded on decimal principles, and for the purpoſe of carrying the ſame into effect, I have formed inſtruments on the ſame plan.

Firſt, *a Compaſs divided into* 400, *degrees,* viz. 100, *degrees to each quarter, and called the* American Compaſs.

Second, *a Chain repreſenting the one hundreth part of an acre, and called the* American Acre Chain.

Third, *a chain repreſenting the one hundreth part of a mile in length, and ten thouſenth of a ſquare mile, and called the* American Mile Chain.

The firſt of theſe chains is for ſurveying land by the acre.

The ſecond, or mile chain, is for the purpoſe of preambulating line between States, Counties, Towns, Diſtricts, &c. and giving the contents in ſquare miles.

A draught of the above inſtruments will be annexed to the work.

To which I have added an half circle, the uſe of which is to aſſiſt the ſurveyor in drawing draughts of ſurveys; in laying down this inſtrument, the points of Compaſs will be eaſily ſet off.

The Scale is one tenth of the Acre Chain and is divided into tenths and hundreths.

I now proceed to the Rule.

Caſe Firſt.

If a piece of land be 64 chains in length, and 32 in bredth, what is its contents in acres?

I firſt place down the length with a point at the left, becauſe it is 64 hundreths of an acre, and the breadth with a point at the right, becauſe it repreſents 32 acres.

,64 Chains in length.
32, Chains in breadth.
——— Multiplying them together.
128
192
———
A. 20,58 Product.

I place my point between the cipher and the 4, beauſe I had two decimal places in my multiplicand, at is, a point at the left of ,64 the length: I find it oduceth 20, acres, and 48 hundreths of an acre, or 8 chains.

What is the contents in acres of a piece of land, that 74 chains by 45 chains?

If a piece of land be 96 chains by 86 chains, how any acres doth it contain?

If a piece of land be 33 chains in length and 7 ch. bredth, how many acres doth it contain?

In all the foregoing caſes, you muſt work as in the it.

If your lines are unequal, you muſt add them together as in the following caſe, and take the half, by dividing the product by 2, whether it be length or breadth.

If a piece of land be 45 chains on one ſide, and 50 on the other, and nine chains in width, what doth it contain?

I ſet down both lines thus, ,45 and add them toge-
,50

ther, and find it makes ,95 then I divide ,95 by 2, and find the mean length to be ,47 chains and 5 tenths, ſtanding thus, ,47'5, which I multiply by 9 chains the width.

If a piece of land be 23 chains and 4 tenths long, and 6 chains at one end, and 4, chains and ,4 tenths at the other, what doth it contain in acres?

If a piece of land be 65 chains and ,45 hundreths of a chain in length, and 44 and ,75 hundreths of a chain in breadth, what is its contents in acres?

Set your numbers thus; ,65'45
44,75

Figure, or No. 1, you muſt add the lines I and K together, and divide the product by 2, which will give you the mean length, then multiply by the perpendicular line A.

No. 2. Take the half of the perpendicular line B, and multiply by line T.

No. 3. Meaſure the triangular part as No. 2.

Then add the line O H, and line I, and work as No. 1; after you have found the contents of each part add them together, and it gives the whole contents of the figure.

No. 4. Take half the perpendicular F, and multiply the centre line G.

No. 5. Add the lines M and N, take the half of their product, and multiply by line L.

No. 6. Halve the perpendicular P, multiply by line 2, then take half the perpendicular R, and multiply line S, add the two products together, and it gives the contents of the whole figure.

The mile chain, bears nearly the ſame relation or proportion to a ſquare mile as an acre chain doth to an acre, with this difference, the acre chain is the one hundreth part of an acre, whereas the mile chain is but the ten thouſenth part of a ſquare mile, and one hundreth part of a lineal mile, for that reaſon in multiplying the width of any given plain or ſurvey, in order to bring out the ſquare miles it contains; you muſt place the number of chains repreſenting the width of any ſuch plain or ſurvey, twenty degrees to the right of the place of the acre chain in bringing out the acre, after pointing off your decimal places on the right what you find on the left of your point, is ſquare miles.

Example Firſt.

Suppoſe a townſhip be 446 chains in length, and 425 chains in breadth, how many ſquare miles doth it contain?

I place my numbers thus: Length 4,46
Bredth 4,25

22 30
89 2
1784

I find my anſwer ſtands thus, miles, 18,95 50 or more clearly 18, ſquare miles, and ,955 thouſenths of a ſquare mile

If a ſurvey be 74 chains in length, and 45 chains breadth, how many ſquare miles doth it contain?

Place your num's, thus ,74 and work as follows.
,45

370
296

Anſwer ,3330 or ,333 thouſenths of a ſquare mile.

If a Survey be 43, Chains in length, and 9, Chains in breadth, what proportion of a ſquare mile doth it contain?

Place your number as follows, ,43
,09

If a Survey be 8, Chains in length and 7, Chains in breadth, what proportion of a ſquare mile doth it contain?

Place your numbers as follows, ,08
,07